MERIDIAN

UNIVERSAL GAS DETECTOR

User Guide

087-0049

Rev C

SCOTT SAFETY

Meridian User Guide

UNIVERSAL GAS DETECTOR

087-0049
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ABOUT THIS GUIDE

Guide Overview

This guide describes the steps required to use the Meridian Gas Detector. This document is for gas detection personnel to manage their gas monitoring device. This document contains information on installation, configuration, operation, maintenance and troubleshooting.

This user guide assumes a basic knowledge of gas detection procedures.

The user guide is divided into the following topics:

- Quick Reference
- Introduction
- Installation
- Configuration and Setup
- Operation
- Maintenance
- Specifications
- Sensor Information
- Safety Integrity Level (SIL-2) Information
- Support

Warning: *Read, understand and follow the entire content of this guide prior to use. Failure to do so may result in serious injury or death.*

Guide Conventions

The following visual elements are used throughout this guide, where applicable:

Warning: *This icon and text indicate a potentially hazardous situation, which, if not avoided, could result in death or injury.*

Caution: *This icon and text indicates a potentially dangerous procedure. Instructions contained in the warning must be followed. Failure to do so may result in damage to the device.*

This icon and text indicate the possibility of electrostatic discharge (ESD) in a procedure that requires the reader to take the proper ESD precautions.

This icon and text designates information of special note.

Related Product Documentation

Table 1 lists the Scott Safety Family documentation set.

Table 1 Scott Safety Documentation Set

DOCUMENT NAME	PURPOSE	DOCUMENT ID
Meridian User Guide	Provides information on the installation, configuration, operation, maintenance and troubleshooting.	087-0049
Meridian Communication Guide	Provides information on the various Optional Communication Expansion Cards (CEC) PCBs.	087-0050

Revision History

Table 2 shows the revision history for this guide, providing a description of the changes.

Table 2 Meridian User Guide Revision History

REVISION	CHANGE
A	Initial release
B	• About Chapter - Updated CSA approvals. • Installation Chapter - Added clarification to 2-Wire Connection. • Configuration and Setup Chapter - Added note for MODBUS Register 40289 related to sensor codes. Changed O_2 Example Current Loops Inhibit value. • Specification Appendix - Added LCD Heater Specification. • Support Appendix - Updated to include Technical Support Houston Service Center and related information.
C	• Configuration and Setup Chapter - Changed Firmware Version. Removed Inhibit from TXCommand 0x200, Write Byte (Transmitter), and removed InhibitTimer from TXCommand 0xX201, Write Unit (Sensor). Added K-Factor parameter. Added information about Combustible IR Sensor to Gas Type parameter. Update Firmware Version to 1.12. Added Enter and Escape commands to Using the TXCommands section. Added CurrentHumidity Register to the Using the MODBUS Registers section. • Maintenance Chapter - Troubleshooting section, added a sub-solution to Troubleshooting Matrix table. Changed three Notes regarding the number of turns to tighten the Meridian Detector Body Assembly. Added Selecting the Combustible IR Sensor's Target Gas section. Added an item to the Troubleshooting the Device section about K-Factors. Added Notes in the Span Calibration section about Combustible IR Sensor and Combustible Cat-Bead Sensor. Changed the MOS gas PPM values for Low and High Span Calibration. Added cross reference for IR Sensors. Added section on Clearing a Sensor Fault. Added LCD Sensor Fault condition to troubleshooting section. • Specifications Appendix - Device Specification section, added 4 to 20mA Current Loop Specifications. CEC section, added Fault Loop Current specification. Changes to six (6) Toxic (E-Chem) Sensors Specifications (096-3473-37, 096-3473-18, 096-3473-17, 096-3473-39, 096-3473-40, & 096-3473-06. Removed three (3) Toxic (E-Chem) Sensors from Specifications Table (096-3473-44, 096-3473-45, & 096-3473-49). • Sensor Information Chapter - Added IR Surrogate Test Gas section. Added to the Combustible Cat-Bead Sensor K-Factors section to include Using Target Gas Other than Methane, Using Methane as a Surrogate Gas, and Using Propane as a Surrogate Gas sections. • Support Chapter - Added eight (8) new IR Sensors part numbers. Added Nafion Tubing to the Low Flow Calibration Kit. Removed three (3) Sensors (096-3473-44, 096-3473-45, & 096-3473-49).

Certifications and Approvals

Table 3 to Table 6 shows the items have been tested and complies with the following directives, standards, or standardized documents for the applicable Transmitter and Junction Box Model Numbers.

Transmitter and Junction Box Special Conditions for Safe Use include the following:

- Meridian 3-4 Wire Transmitter Models 096-3522 and 096-3526 are for use with Detector Head Models 096-3484-01 or 096-3484-02.
- Meridian 2 Wire Transmitter Models 096-3521 and 096-3525 are for use with Detector Head Models 096-3484-03 or 096-3484-04.
- All openings to the transmitter must sealed using suitable flame-proof, type 'd' stopping boxes or type 'd' glands with a minimum IP rating of IP66.
- All openings to the junction box must sealed using suitable glands with a minimum IP rating of IP66.
- Transmitter must be bonded to ground both internally and externally with suitably sized conductors (IEC/EN 60079-0, cl. 15.3).
- The 2 wire system may only be used with a single Electrochemical sensor and must installed in accordance with control drawing 096-3507-B.
- The 3-4 Wire system may be used with one to three sensors and must be installed in accordance with control drawing 096-3506-B.
- All Transmitter connection wire must be specified in accordance with the following conditions:
  - For Installations Ta $\leq$ 60°C: Temperature rating equal to or greater than 105ºC and be a minimum of 18AWG (1.0mm2).
  - For Installations Ta > 60°C: Temperature rating equal to or greater than 120ºC and be a minimum of 18AWG (1.0mm2).
- The equipment shall be regularly cleaned to ensure there is no dust accumulated on the surface in excess of 5mm.

Table 3 Certifications & Approvals - Aluminum Transmitter

MODEL NO. 096-3521 & 096-3522	SPECIFIC DIRECTIVES, STANDARDS
  TRAC13ATEX0049X II 2(1) G Ex d [ia Ga] IIC T4 Gb II 2(1) D Ex tb [ia Da] III C T85° C Db -40°C ≤ Ta ≤ +75°C IP66 *See Special Conditions for Safe Use	EN 60079-0 :2012 EN 60079-26 :2007 EN 50104 :2010 EN 60079-26 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270 :2006 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
IECEx TRC 13.0017X Ex d [ia Ga] IIC T4 Gb Ex tb [ia Da] III C T85° C Db -40°C ≤ Ta ≤ +75°C IP66 *See Special Conditions for Safe Use	IEC 60079-0 :2012 IEC 60079-26 :2007 IEC 60079-26 IEC 60079-1 :2007 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2012 IEC 60079-31 :2009
  See 096-3506-B and 096-3507-B	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 CAN/CSA-C22.2 No. 152
  See 096-3506-B and 096-3507-B	FM 3600 FM 3615 FM 3616 UL 913 FM 6310/6320 ANSI/ISA-12.13.01
	EMC
Industry Canada	EMC
	EMC Directive ATEX Directive

Table 3 Certifications & Approvals - Aluminum Transmitter (continued)

MODEL NO. 096-3521 & 096-3522	SPECIFIC DIRECTIVES, STANDARDS
Functional Safety Type Approved TÜVRheinland FS	IEC 61508 Series

Table 4 Certifications & Approvals - Stainless Steel Transmitter

MODEL NO. 096-3525 & 096-3526	SPECIFIC DIRECTIVES, STANDARDS
Ex TRAC13ATEX0049X I M2(M1) Ex d [ia Ma] I Mb II 2(1) G Ex d [ia Ga] IIC T4 Gb II 2(1) D Ex td [ia Da] IIIC T85° C Db -40°C ≤ Ta ≤ +75°C IP66 *See Special Conditions for Safe Use	EN 60079-0 :2012 EN 60079-26 :2007 EN 50104 :2010 EN 60079-26 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270 :2006 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
IECEx TRC 13.0017X Ex d [ia Ma] I Mb Ex d [ia Ga] IIC T4 Gb Ex td [ia Da] IIIC T85° C Db -40°C ≤ Ta ≤ +75°C IP66 *See Special Conditions for Safe Use	IEC 60079-0 :2012 IEC 60079-26 :2007 IEC 60079-26 IEC 60079-1 :2007 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2012 IEC 60079-31 :2009
SP® See 096-3506-B and 096-3507-B	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 CAN/CSA-C22.2 No. 152
SP® US See 096-3506-B and 096-3507-B	FM 3600 FM 3615 FM 3616 UL 913 FM 6310/6320 ANSI/ISA-12.13.01

Table 4 Certifications & Approvals - Stainless Steel Transmitter (continued)

MODEL NO. 096-3525 & 096-3526	SPECIFIC DIRECTIVES, STANDARDS
FC	EMC
Industry Canada	EMC
CE	EMC Directive ATEX Directive
Functional Safety Type Approved TÜVRheinland FS	IEC 61508 Series

Table 5 Certifications & Approvals - Aluminum Junction Box

MODEL NO. 096-3475	SPECIFIC DIRECTIVES, STANDARDS
Ex TRAC13ATEX0049X II 2 G Ex ia IIC T4 Ga II 2 D Ex ia IIIC T80°C Da -40°C ≤ Ta ≤+75°C IP64 *See Special Conditions for Safe Use	EN 60079-0 :2012 EN 60079-26 :2007 EN 50104 :2010 EN 60079-26 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270 :2006 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
IECEx TRC 13.0017X Ex ia IIC T4 Ga Ex ia IIIC T80°C Da -40°C ≤ Ta ≤+75°C IP64 *See Special Conditions for Safe Use	IEC 60079-0 :2012 IEC 60079-26 :2007 IEC 60079-26 IEC 60079-1 :2007 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2012 IEC 60079-31 :2009

Table 5 Certifications & Approvals - Aluminum Junction Box

MODEL NO. 096-3475	SPECIFIC DIRECTIVES, STANDARDS
C SP US See 096-3506-B and 096-3507-B	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 FM 3616 UL 913
CE	EMC Directive ATEX Directive

Table 6 Certifications & Approvals - Stainless Steel Junction Box

MODEL NO. 096-3520	SPECIFIC DIRECTIVES, STANDARDS
Ex TRAC13ATEX0049X I M2 Ex ia I Ma II 2 G Ex ia IIC T4 Ga II 2 D Ex ia IIIC T80°C Da -40°C ≤ Ta ≤ +75°C IP64 *See Special Conditions for Safe Use	EN 60079-0 :2012 EN 60079-26 :2007 EN 50104 :2010 EN 60079-26 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270 :2006 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
IECEx TRC 13.0017X Ex ia I Ma Ex ia IIC T4 Ga Ex ia IIIC T80°C Da -40°C ≤ Ta ≤ +75°C IP64 *See Special Conditions for Safe Use	IEC 60079-0 :2012 IEC 60079-26 :2007 IEC 60079-26 IEC 60079-1 :2007 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2012 IEC 60079-31 :2009
CE	ATEX Directive (94/9/EC) EMC Directive (2004/108/EC)

Table 6 Certifications & Approvals - Stainless Steel Junction Box

MODEL NO. 096-3520	SPECIFIC DIRECTIVES, STANDARDS
C US See 096-3506-B and 096-3507-B	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 FM 3616 UL 913

Table 7 to Table 8 shows the items have been tested and complies with the following directives, standards, or standardized documents for the applicable Detector Head with Sensors Model Numbers.

Detector Head with Sensors Special Conditions for Safe Use include the following:

- Meridian Detector Head Models 096-3484-01 and 096-3484-02 are for use with Meridian 3-4 Wire Transmitter Models 096-3522 or 096-3526.
- Meridian Detector Head Models 096-3484-03 and 096-3484-04 are for use with Meridian 2 Wire Transmitter Models 096-3521 or 096-3525.
- The 2 wire system may only be used with a single Electrochemical sensor and must installed in accordance with control drawing 096-3507-B.
- The 3-4 Wire system may be used with one to three sensors and must be installed in accordance with control drawing 096-3506-B.
- The detector head end cap (PN 096-3437-1 or 096-3437-2) must also be installed and securely fastened during normal operations.
- Sensors may only be installed or removed when the area is clean and dry.
- The sensor simulator is only for temporary use under direct supervisions with the following conditions:
  - To only be used in clean, dry environments
  - Must be protected from impact
- The equipment shall be regularly cleaned to ensure there is no dust accumulated on the surface in excess of 5mm.

Table 7 Certifications & Approvals - 3-4 Wire Detector Head

MODEL NO. WITH SENSOR 096-3484-01 & 096-3484-02	SPECIFIC DIRECTIVES, STANDARDS
  TRAC13ATEX0049X I M2 Ex d ia I Mb II 2 G Ex d ia IIC T4 Gb II 2 D Ex ia IIIC T185°C Db -40°C ≤ Ta ≤ +75°C IP64 For Integral Connection to Transmitter. Any Meridian Sensor Installed. *See Special Conditions for Safe Use	EN 60079-0 :2012 EN 60079-26 :2007 EN 50104 :2010 EN 60079-26 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270 :2006 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
IECEx TRC 13.0017X Ex d ia I Mb Ex d ia IIC T4 Gb Ex ia IIIC T185°C Db -40°C ≤ Ta ≤ +75°C IP64 For Integral Connection to Transmitter. Any Meridian Sensor Installed. *See Special Conditions for Safe Use	IEC 60079-0 :2012 IEC 60079-26 :2007 IEC 60079-26 IEC 60079-1 :2007 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2012 IEC 60079-31 :2009
  See 096-3506-B and 096-3507-B For Integral Connection to Transmitter. Any Meridian Sensor Installed.	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 FM 3616 UL 913

Table 7 Certifications & Approvals - 3-4 Wire Detector Head (continued)

MODEL NO. WITH SENSOR 096-3484-01 & 096-3484-02	SPECIFIC DIRECTIVES, STANDARDS
  TRAC13ATEX0049X I M1 Ex ia I Ma II 1 G Ex ia IIC T4 Ga II 1 D Ex ia IIIC T185°C Da -40°C ≤ Ta ≤+75°C IP64 For Remote Connection: Dependent upon Sensor - Refer to Certificate and User Manual. Without IR Type Sensor Installed. *See Special Conditions for Safe Use	EN 60079-0 :2012 EN 60079-26 :2007 EN 50104 :2010 EN 60079-26 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270 :2006 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
  TRAC13ATEX0049X I M1 Ex ia I Ma II 1 G Ex ia IIC T4 Ga II 1 D Ex ia IIIC T185°C Da -40°C ≤ Ta ≤+75°C IP64 For Remote Connection: Dependent upon Sensor - Refer to Certificate and User Manual. Without IR Type Sensor Installed. *See Special Conditions for Safe Use	EN 60079-0 :2012 EN 60079-26 :2007 EN 50104 :2010 EN 60079-26 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270 :2006 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
  See 096-3506-B and 096-3507-B For Remote Connection: Dependent upon Sensor - Refer to Certificate and User Manual. Without IR Type Sensor Installed.	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 FM 3616 UL 913

Table 7 Certifications & Approvals - 3-4 Wire Detector Head (continued)

MODEL NO. WITH SENSOR 096-3484-01 & 096-3484-02	SPECIFIC DIRECTIVES, STANDARDS
IECEx TRC 13.0017X Ex d ia I Mb Ex d ia IIC T4 Gb Ex ia IIIC T110°C Db -40°C ≤ Ta ≤ +75°C IP64 For Remote Connection: Dependent upon Sensor - Refer to Certificate and User Manual. With IR Type Sensor Installed. *See Special Conditions for Safe Use	IEC 60079-0 :2012 IEC 60079-26 :2007 IEC 60079-26 IEC 60079-1 :2007 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2012 IEC 60079-31 :2009
IECEx TRC 13.0017X Ex d ia I Mb Ex d ia IIC T4 Gb Ex ia IIIC T110°C Db -40°C ≤ Ta ≤ +75°C IP64 For Remote Connection: Dependent upon Sensor - Refer to Certificate and User Manual. With IR Type Sensor Installed. *See Special Conditions for Safe Use	IEC 60079-0 :2012 IEC 60079-26 :2007 IEC 60079-26 IEC 60079-1 :2007 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2012 IEC 60079-31 :2009
C SP US See 096-3506-B and 096-3507-B For Remote Connection: Dependent upon Sensor - Refer to Certificate and User Manual. With IR Type Sensor Installed.	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 FM 3616 UL 913
FC	EMC
Industry Canada	EMC

Table 7 Certifications & Approvals - 3-4 Wire Detector Head (continued)

MODEL NO. WITH SENSOR 096-3484-01 & 096-3484-02	SPECIFIC DIRECTIVES, STANDARDS
CE	EMC Directive ATEX Directive

Table 8 Certifications & Approvals - 2-Wire Detector Head

MODEL NO. WITH SENSOR 096-3484-03 & 096-3484-04	SPECIFIC DIRECTIVES, STANDARDS
  TRAC13ATEX0049X I M2 Ex d ia I Mb II 2 G Ex d ia IIC T4 Gb II 2 D Ex ia IIIC T80°C Db -40°C ≤ Ta ≤+75°C IP64 For Integral Connection to Transmitter. *See Special Conditions for Safe Use	EN 60079-0 :2012 EN 60079-26 :2007 EN 50104 :2010 EN 60079-26 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270 :2006 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
IECEx TRC 13.0017X Ex d ia I Mb Ex d ia IIC T4 Gb Ex ia IIIC T80°C Db -40°C ≤ Ta ≤+75°C IP64 For Integral Connection to Transmitter. *See Special Conditions for Safe Use	IEC 60079-0 :2012 IEC 60079-26 :2007 IEC 60079-26 IEC 60079-1 :2007 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2012 IEC 60079-31 :2009

Table 8 Certifications & Approvals - 2-Wire Detector Head (continued)

MODEL NO. WITH SENSOR 096-3484-03 & 096-3484-04	SPECIFIC DIRECTIVES, STANDARDS
  See 096-3506-B and 096-3507-B For Integral Connection to Transmitter. Any Meridian Sensor Installed.	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 FM 3616 UL 913
  TRAC13ATEX0049X I M1 Ex ia I Ma II 1 G Ex ia IIC T4 Ga II 1 D Ex ia IIIC T80°C Da -40°C ≤ Ta ≤ +75°C IP64 For Remote Connection. *See Special Conditions for Safe Use	EN 60079-0 :2012 EN 60079-26 :2007 EN 50104 :2010 EN 60079-26 EN 55011 :2009 +A1 :2010 EN 60079-1 :2007 EN 60079-29-1 :2007 EN 50270 :2006 EN 61010-1 :2010 EN 60079-11 :2012 EN 60079-31 :2009 EN 50271 :2010
IECEx TRC 13.0017X Ex ia I Ma Ex ia IIC T4 Ga Ex ia IIIC T80°C Da -40°C ≤ Ta ≤ +75°C IP64 For Remote Connection. *See Special Conditions for Safe Use	IEC 60079-0 :2012 IEC 60079-26 :2007 IEC 60079-26 IEC 60079-1 :2007 IEC 60079-29-1 :2007 IEC 61010-1 :2010 IEC 60079-11 :2012 IEC 60079-31 :2009
  See 096-3506-B and 096-3507-B For Remote Connection.	CAN/CSA-C22.2 No. 60079-0 CAN/CSA-C22.2 No. 60079-1 CAN/CSA-C22.2 No. 60079-11 FM 3600 FM 3615 FM 3616 UL 913

Table 8 Certifications & Approvals - 2-Wire Detector Head (continued)

MODEL NO. WITH SENSOR 096-3484-03 & 096-3484-04	**SPECIFIC DIRECTIVES, STANDARDS**
CE	ATEX Directive (94/9/EC) EMC Directive (2004/108/EC)
FC	EMC
Industry Canada	EMC

Table 9 to Table 11 shows the items have been tested and complies with the following directives, standards, or standardized documents for the applicable Sensor Model Numbers.

Table 9 Certifications & Approvals - E-Chem Sensors

MODEL NO. 096-3473-01 TO 096-3473-54	SPECIFIC DIRECTIVES, STANDARDS
 TRAC13ATEX0049X IECEx TRC 13.0017X Ex ia I Ma Ex ia IIC T4 Ga Ex ia IIIC T80° C Da	IEC/EN 60079-0 :2012 IEC/EN 60079-26 :2007 EN 50104 :2010 IEC/EN 60079-26 EN 55011 :2009 +A1 :2010 IEC/EN 60079-1 :2007 IEC/EN 60079-29-1 :2007 EN 50270 :2006 IEC/EN 61010-1 :2010 IEC/EN 60079-11 :2012 IEC/EN 60079-31 :2009 EN 50271 :2010
	EMC
Industry Canada	EMC

Table 10 Certifications & Approvals - Cat-Bead & MOS Sensors

MODEL NO. 096-3473-55 & 096-3473-57	SPECIFIC DIRECTIVES, STANDARDS
 TRAC13ATEX0049X IECEx TRC 13.0017X Ex ia I Ma Ex ia IIC T4 Ga Ex ia IIIC T185° C Da	IEC/EN 60079-0 :2012 IEC/EN 60079-26 :2007 EN 50104 :2010 IEC/EN 60079-26 EN 55011 :2009 +A1 :2010 IEC/EN 60079-1 :2007 IEC/EN 60079-29-1 :2007 EN 50270 :2006 IEC/EN 61010-1 :2010 IEC/EN 60079-11 :2012 IEC/EN 60079-31 :2009 EN 50271 :2010
	EMC
Industry Canada	EMC

Table 11 Certifications & Approvals - IR Sensors

MODEL NO. 096-3473-56 & 096-3473-58	SPECIFIC DIRECTIVES, STANDARDS
 TRAC13ATEX0049X IECEx TRC 13.0017X Ex ia I Mb Ex d ia IIC T4 Gb Ex ia IIIC T110°C Db	IEC/EN 60079-0 :2012 IEC/EN 60079-26 :2007 EN 50104 :2010 IEC/EN 60079-26 EN 55011 :2009 +A1 :2010 IEC/EN 60079-1 :2007 IEC/EN 60079-29-1 :2007 EN 50270 :2006 IEC/EN 61010-1 :2010 IEC/EN 60079-11 :2012 IEC/EN 60079-31 :2009 EN 50271 :2010
	EMC
Industry Canada	EMC

General Safety Information

Ensure you adhere to the following for your safety.

Warning: *Read and follow the entire content of this guide prior to use. Failure to do so may result in serious injury or death.*

Warning: *All individuals who have or will have responsibility for using or testing this product must read and understand the contents of this manual. The product will perform as designed only if used and tested in accordance with the manufacturer's instructions. Failure to follow manufacturer's instructions will render the warranty and approvals null and void. Failure to follow these instructions may also result in serious injury or death.*

Scott Safety can take no responsibility for use of its equipment if it is not used in accordance with the instructions. If further operational or maintenance details are required but not provided in this guide, contact Scott Safety or their agent. Scott Safety shall not be liable for any incidental or consequential damages in connection with any modifications, errors or omissions in this guide.

All pertinent national, state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to assure compliance with documented system data, repairs to components should be performed only by the manufacturer.

Additionally, industry standards, codes, and legislation are subject to change. Updated copies should be obtained by users to ensure the most recently issued regulations, standards and guidelines are available.

All pertinent state, regional, and local safety regulations must be observed when handling and disposing of hazardous material, Toxic (E-Chem) Sensors, batteries and other similar items that may fall under the classification of hazardous material.

Only use Scott Safety approved replacement parts.

Warnings and Cautions – Device Use and Care

Ensure you follow the applicable warnings and cautions indicated here.

Warning: *This equipment must be operated and serviced by qualified personnel only. Read and understand the guide completely before operating or servicing. Qualified personnel as defined according to local, county, state, federal and individual company standards.*

Warning: *When in doubt vacate the area immediately. You should vacate the area immediately should the device indicate a warning or alarm condition. You should know and understand your company's safety protocols.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting any of the procedures.*

Warning: *When the primary device is off line, ensure you have another online device to actively detect gases. The device may be off line due to such activities, like but not limited to, calibration, installation, maintenance, troubleshooting, configuration, wiring and other activities.*

Warning: *If the device does not function as described herein, remove from service and mark for maintenance. Only use Scott Safety replacement parts.*

Warning: *Only use the device to monitor the atmosphere for the gases and concentrations for which it is set-up to detect.*

Warning: *Verify the cover, internal PCB's and field wiring are securely in place before applying power and operation.*

Warning: *Do not expose the device to electrical shock or continuous severe mechanical shock.*

Warning: *Do not use the device if its enclosure is damaged, cracked, or has missing components.*

Warning: *Protect the device from dripping liquids and high power sprays.*

Caution: *Device will not operate without power applied. Thus, it only detects gases while powered.*

Caution: *Use only a sensor assembly compatible with the device and approved by Scott Safety.*

Caution: *Periodically test for correct operation of the system's alarm events by exposing the device to a targeted gas concentration above the high alarm set point.*

Caution: *Calibration is critical. Calibration should be performed periodically that takes into account device use and environment conditions. Calibrate with known target gas at start-up and check on a regular schedule. The device should always be re-calibrated after exposure to high concentrations of toxic or combustible gases or vapors.*

Warnings and Cautions – Sensor Use and Care

Ensure you follow the applicable warnings and cautions indicated here.

Warning: *Extended exposure of the detector to high concentrations of toxic or combustible gases may result in degraded sensor performance. If an alarm occurs due to high concentration of combustible gases, recalibrate the device or, if needed, replace the sensor.*

Caution: *Be aware of poisoned combustible sensors. The operation of catalytic type combustible gas sensors may be seriously affected by silicones, free halogens, halogenated hydrocarbons and metallic oxides present in the ambient air being monitored. If the presence of any of these substances is suspected, increased frequency of calibration verification is recommended.*

Caution: *Sensitivity of the combustible gas sensor can be adversely affected by exposure to sulfur compounds, halogens, silicone or lead containing compounds, or phosphorus containing compounds. Avoid exposure to these substances. Should the detector be suspected of being exposed to such substances, perform a gas test to verify its accuracy and that it is calibrated accordingly.*

Chapter 1

SCOTT QUICK REFERENCE

Chapter Overview

This chapter covers the following topic:

- Typical Quick Reference

Typical Quick Reference

This section provides a brief amount of information as a typical quick reference. See Table 12.

Warning: *This is not a substitute for the User Guide. All individuals who have or will have the responsibility of using or servicing the device must read and understand the contents of the User Guide prior to operation. Failure to do so may result in serious injury or death.*

Table 12 Typical Quick Reference

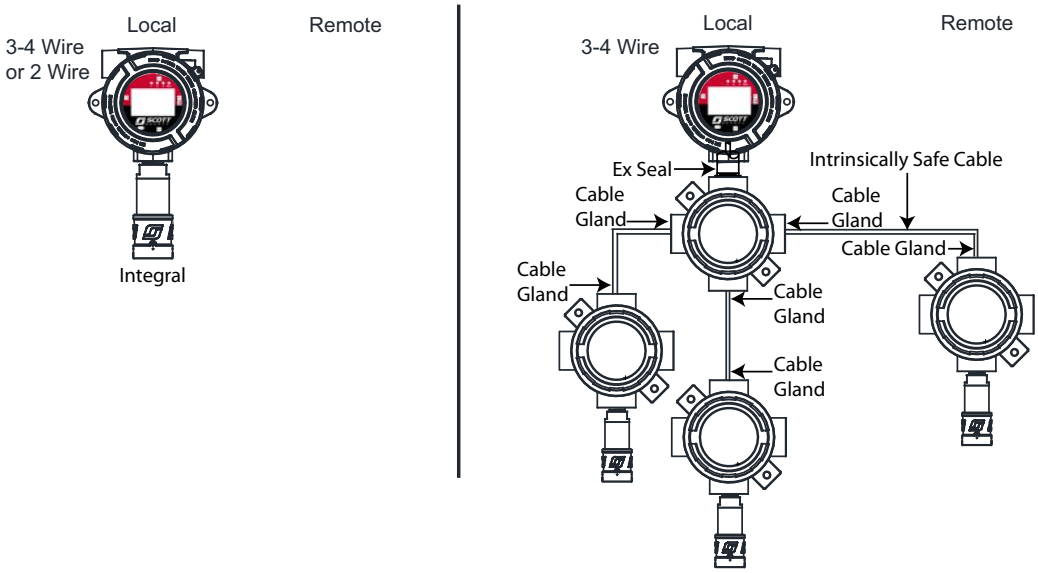
ITEM	OBJECT
Typical Configurations (Remote)	 Note: Intrinsically Safe Cable distance from Transmitter to any Sensor is 100Ft. (30.48m) Maximum. Reference control drawings: 096-3506-B for 3-4 Wire and 096-3507-B for 2 Wire.

Table 12 Typical Quick Reference

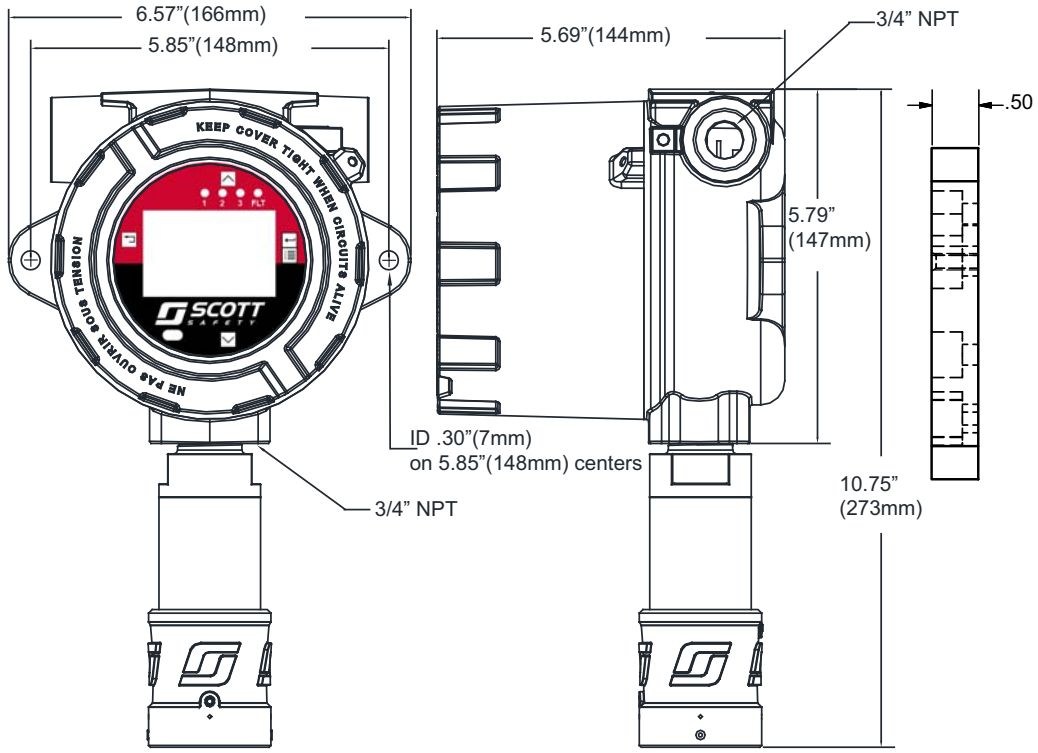
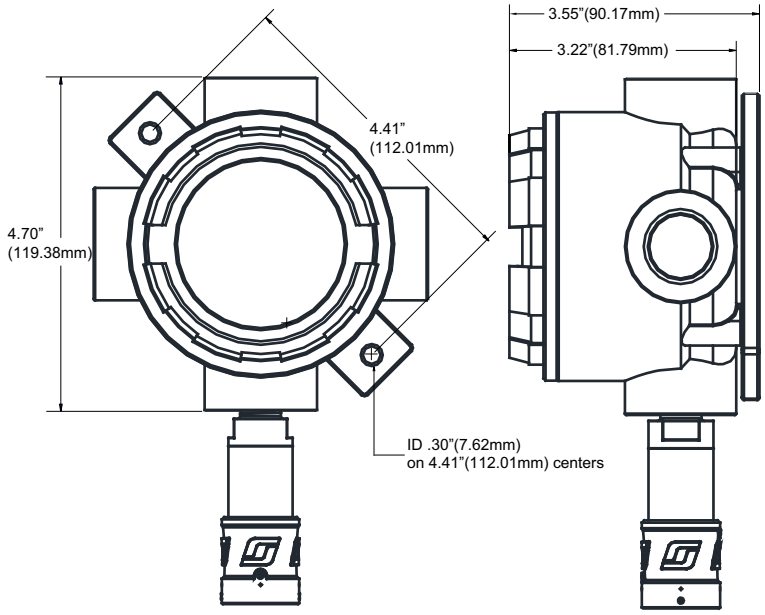
ITEM	OBJECT
Mounting – Aluminum Device (Local)	
Mounting – Meridian J-Box Assembly (Al)	

Table 12 Typical Quick Reference

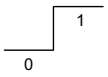
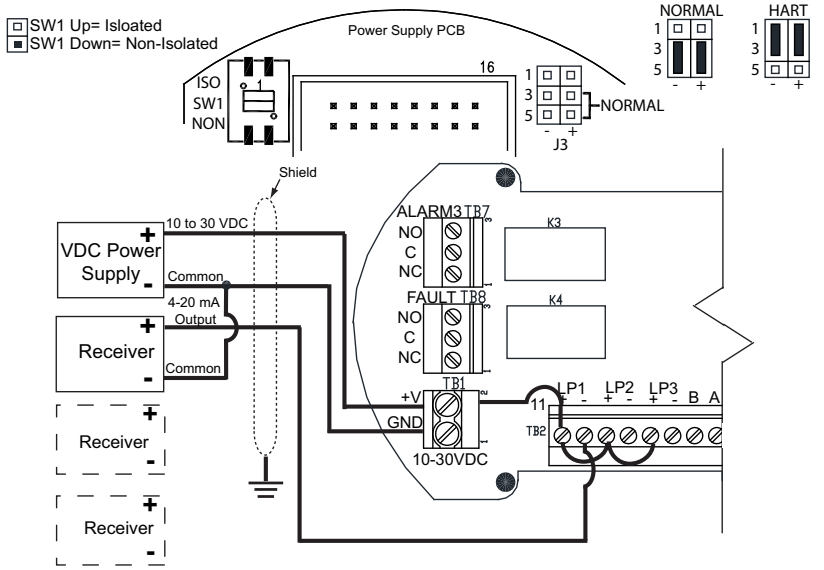
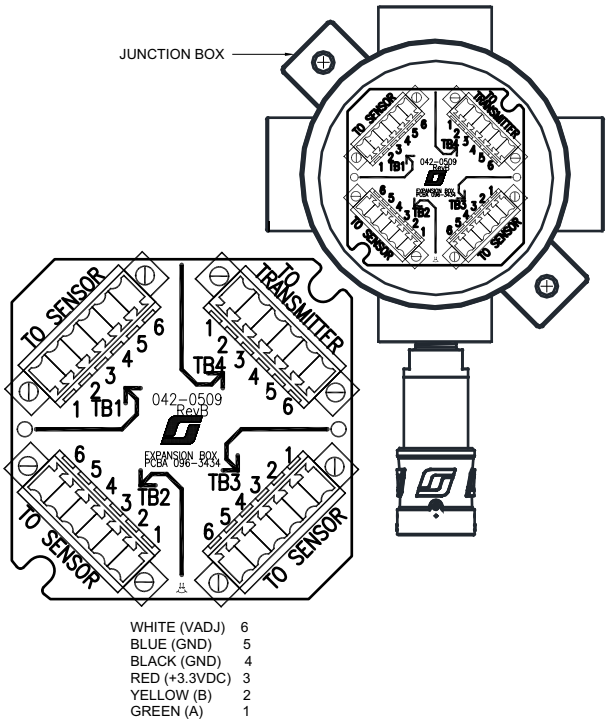
ITEM	OBJECT
Typical Wiring – 3 Wire Sourcing 	This is an example. Other wiring configurations are possible and vary based on each application. 
Wiring – Meridian J-Box Assembly	*Light blue terminal blocks indicate Intrinsically Safe circuits. Tighten plug retention screws.*  Note: Intrinsically Safe Cable distance from Transmitter to any Sensor is 100Ft. (30.48m) Maximum. Reference control drawings: 096-3506-B for 3-4 Wire and 096-3507-B for 2 Wire.

Table 12 Typical Quick Reference

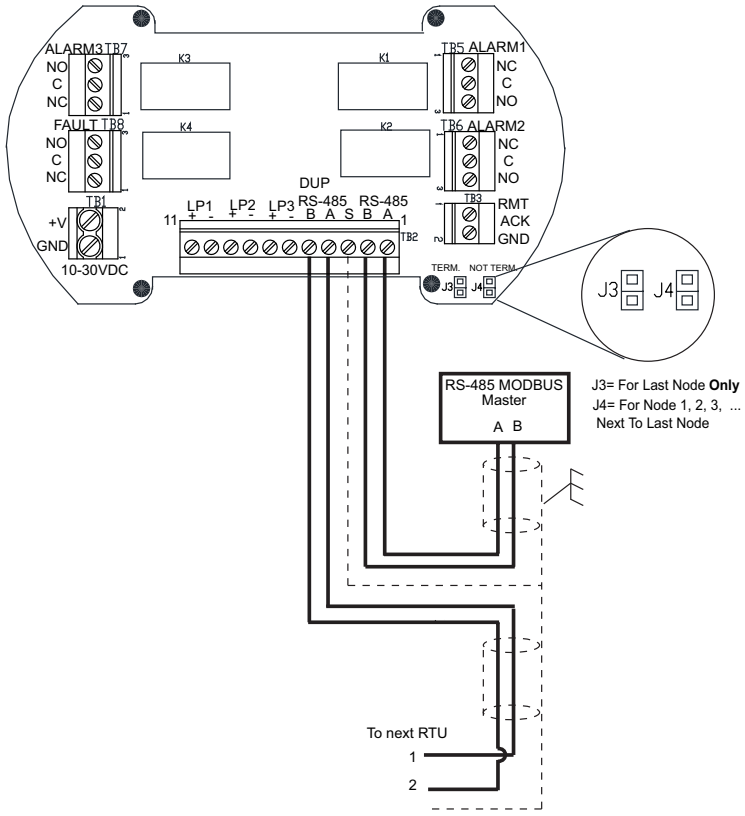
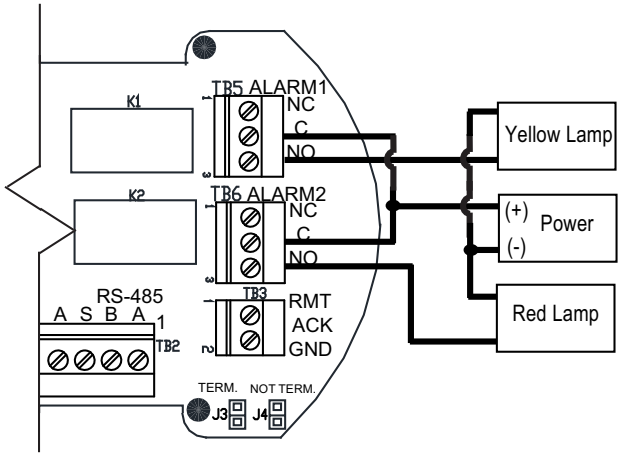
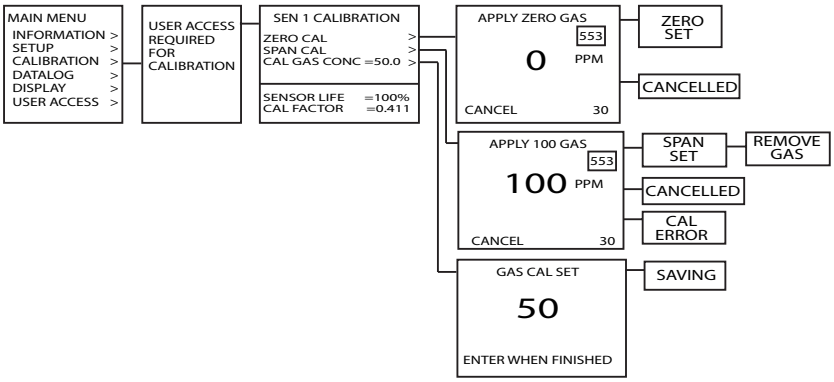
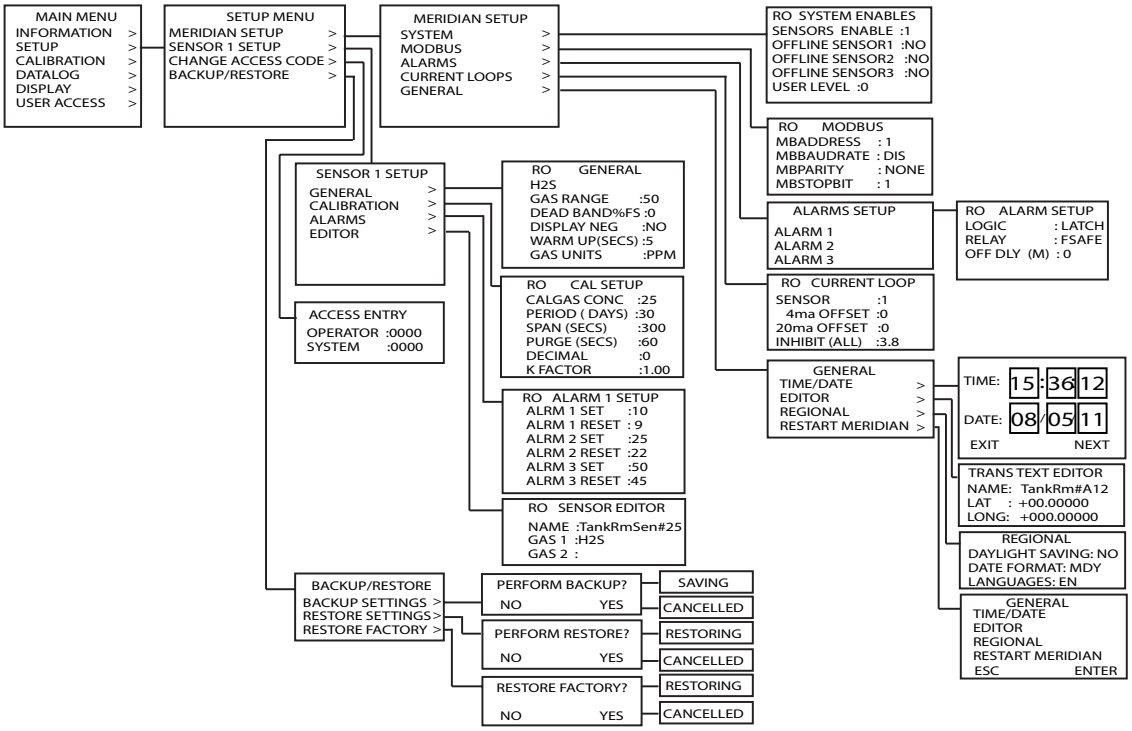
ITEM	OBJECT
Wiring – MODBUS	
Wiring – Alarm/Relay	

Table 12 Typical Quick Reference

ITEM	OBJECT
Calibration – Zero/Span	Access MAIN MENU to configure via LCD. To access Calibration requires a User level password. The default password is 0000.  MAIN MENU INFORMATION >SETUP >CALIBRATION >DATALOG >DISPLAY >USER ACCESS > USER ACCESS REQUIRED FOR CALIBRATION SEN 1 CALIBRATION ZERO CAL >SPAN CAL >CAL GAS CONC =50.0 >SENSOR LIFE =100%CAL FACTOR =0.411 APPLY ZERO GAS 553 0 PPM CANCEL 30 ZERO SET CANCELLED APPLY 100 GAS 553 100 PPM CANCEL 30 SPAN SET REMOVE GAS CANCELLED CAL ERROR GAS CAL SET 50 ENTER WHEN FINISHED SAVING
Setup – Alarm/Relay	Access MAIN MENU to configure via LCD. RO on LCD indicates a password is required. To access Setup requires a User level password. The default password is 0000.  MAIN MENU INFORMATION >SETUP >CALIBRATION >DATALOG >DISPLAY >USER ACCESS > SETUP MENU MERIDIAN SETUP >SENSOR 1 SETUP >CHANGE ACCESS CODE >BACKUP/RESTORE > MERIDIAN SETUP SYSTEM >MODBUS >ALARMS >CURRENT LOOPS >GENERAL >RO SYSTEM ENABLES SENSORS ENABLE :1OFFLINE SENSOR1 :NOOFFLINE SENSOR2 :NOOFFLINE SENSOR3 :NOUSER LEVEL :0 RO MODBUS MBADDRESS : 1MBBAUDRATE : DISMBPARITY : NONEMBSTOPBIT : 1 ALARMS SETUP ALARM 1ALARM 2ALARM 3 RO ALARM SETUP LOGIC : LATCHRELAY : FSAFEOFF DLY (M) : 0 SENSOR 1 SETUP GENERAL >CALIBRATION >ALARMS >EDITOR > RO GENERAL H2SGAS RANGE :50DEAD BAND%FS :0DISPLAY NEG :NOWARM UP(SECS) :5GAS UNITS :PPM RO CAL SETUP CALGAS CONC :25PERIOD (DAYS) :30SPAN (SECS) :300PURGE (SECS) :60DECIMAL :0K FACTOR :1.00 RO CURRENT LOOP SENSOR :1 4ma OFFSET :020ma OFFSET :0INHIBIT (ALL) :3.8 ACCESS ENTRY OPERATOR :0000SYSTEM :0000 RO ALARM 1 SETUP ALRM 1 SET :10ALRM 1 RESET : 9ALRM 2 SET :25ALRM 2 RESET :22ALRM 3 SET :50ALRM 3 RESET :45 GENERAL TIME/DATE >EDITOR >REGIONAL >RESTART MERIDIAN > TIME: 15:36:12 DATE: 08/05/11 EXIT NEXT RO SENSOR EDITOR NAME :TankRmSen#25GAS 1 :H2SGAS 2 : TRANS TEXT EDITOR NAME: TankRm#A12LAT : +00.00000LONG: +000.00000 REGIONAL DAYLIGHT SAVING: NODATE FORMAT: MDYLANGUAGES: EN BACKUP/RESTORE BACKUP SETTINGS >RESTORE SETTINGS >RESTORE FACTORY > PERFORM BACKUP? NO YES SAVING CANCELLED PERFORM RESTORE? NO YES RESTORING CANCELLED RESTORE FACTORY? NO YES RESTORING CANCELLED GENERAL TIME/DATEEDITORREGIONALRESTART MERIDIANESC ENTER

Chapter 2

SCOTT INTRODUCTION

Chapter Overview

This chapter covers the following topics:

- Device Overview

Device Overview

The Meridian Gas Transmitter is a fixed-point device designed to provide continuous monitoring of Combustible gases (range: 0 to 100% LEL), Toxic gases (range: varies based on the individual Sensor type).

The device receives inputs from up to three (3) Meridian Detector Bodies and transmits the output to a remote monitoring system. The Meridian Detector Bodies can be used for these applications based on the installed Sensor:

- To detect Toxic gases in ambient atmospheres; it accepts Electrochemical (E-Chem) Sensors. Traditional, as well as Rock Solid sensors are available. For the detection of Hydrogen Sulfide (H_2S), it also accepts Metal Oxide Semiconductor (MOS) Sensor. (It can also be detected with a variety of E-Chem sensors).
- To detect Hydrocarbon Combustibles in ambient atmospheres; it accepts either Catalytic Bead (Cat-bead), or miniaturized Infrared (IR) Sensors. Miniaturized IR sensors are also used to detect carbon dioxide.

See "Specifications" on page 129.

Except where noted, functionality of the device is not affected by the type of Sensor installed.

Standard device features include:

- Selectable Sensor Ranges – Multiple ranges available to match your application needs.
- A LCD – For quick and easy User Interface (UI) for access to menus. The LCD may be installed in multiple orientations using its pluggable design and is also visible in bright sunlight. Optional heated LCD available for refrigerated conditions.
- Four (4) Alarm LEDs (ALM1, ALM2, ALM3 and FAULT) – For field equipment alarm levels.
- Truly Universal – Accepts all Sensor Types and retains Approvals regardless of its installed Sensor.
- Non-Volatile Memory (NV-EEPROM) – Retains all configuration parameters of the device in the event of a power interruption or loss.
- Equipped with MODBUS RTU (RS-485) Communications capabilities. It supports up to 247 addressed Remote Terminal Units (RTUs). Up to 32 RTUs per loop.
- Automatic Calibration – Count down timer ensure Sensor Zero and Span Calibration for better detection and safety of personnel and property.
- Multiple Navigation Keys – For device configuration, calibration and fault analysis without opening the enclosure.
- Four (4) Discrete Relays and a Remote Reset connection. The four (4) Discrete Relays can be wired to notification alarm equipment (such as lights, and audible).

- Real Time Clock (RTC) and Calendar – Provides a time stamp capability. Thus, allows data logging of calibrations and alarm events for recall to the LCD or over the MODBUS RTU (RS-485) Serial port.
- Plug-N-Play Intelligent Sensors – Sensor gas types and technologies automatically displays on LCD, hot-swappable effortlessly to reduce downtime and equipped with microprocessor.
- Modular Design – For easy installation, allows up to three (3) Sensor Heads configurable within permitted combinations for local and remote locations using 3-4 Wire PCB.
- Housings – Two (2) available options: Aluminium or Stainless Steel.
- Optional Communications – Supports a variety of Communication Protocols via PCBs to meet your communications needs.

The device ships pre-configured using the factory default settings. However, you my want to reconfigure some of the parameters based upon your application. See "Configuration Defaults" on page 81.

Sensors shipped with the device are calibrated at the factory. However, Spare Sensors must be calibrated prior to use.

Warning: *Periodic Calibration checks are needed to assure dependable performance. Operating the device that has exceeded its calibration date can cause false readings of detected gases. Readings obtained while device is out of calibration may be invalid and could lead to death or injury.*

Other accessories are available to aid you in your use of the device. For a complete list, See "Parts List" on page 160. Here are only a few examples:

- Meridian Junction Box Assembly – Allows mounting the Sensor at remote locations for better detection since some gases rise and some sink.
- Duct Mount Adaptor – Allows the monitoring of airflow in exhaust or ventilation ducts.
- Calibration Adaptor – Allows direct calibration flow to the sensor face without dilution from environmental interferences such as wind.
- Sensor Simulator – Used for easy troubling shooting, acceptance testing (SAT) and commissioning. Simulator is for temporary use only.

If you have any questions about the device or its operation contact Scott Safety. See "Technical Service" on page 158.

Figure 1 shows the major parts of the device.

Figure 1 Major Parts

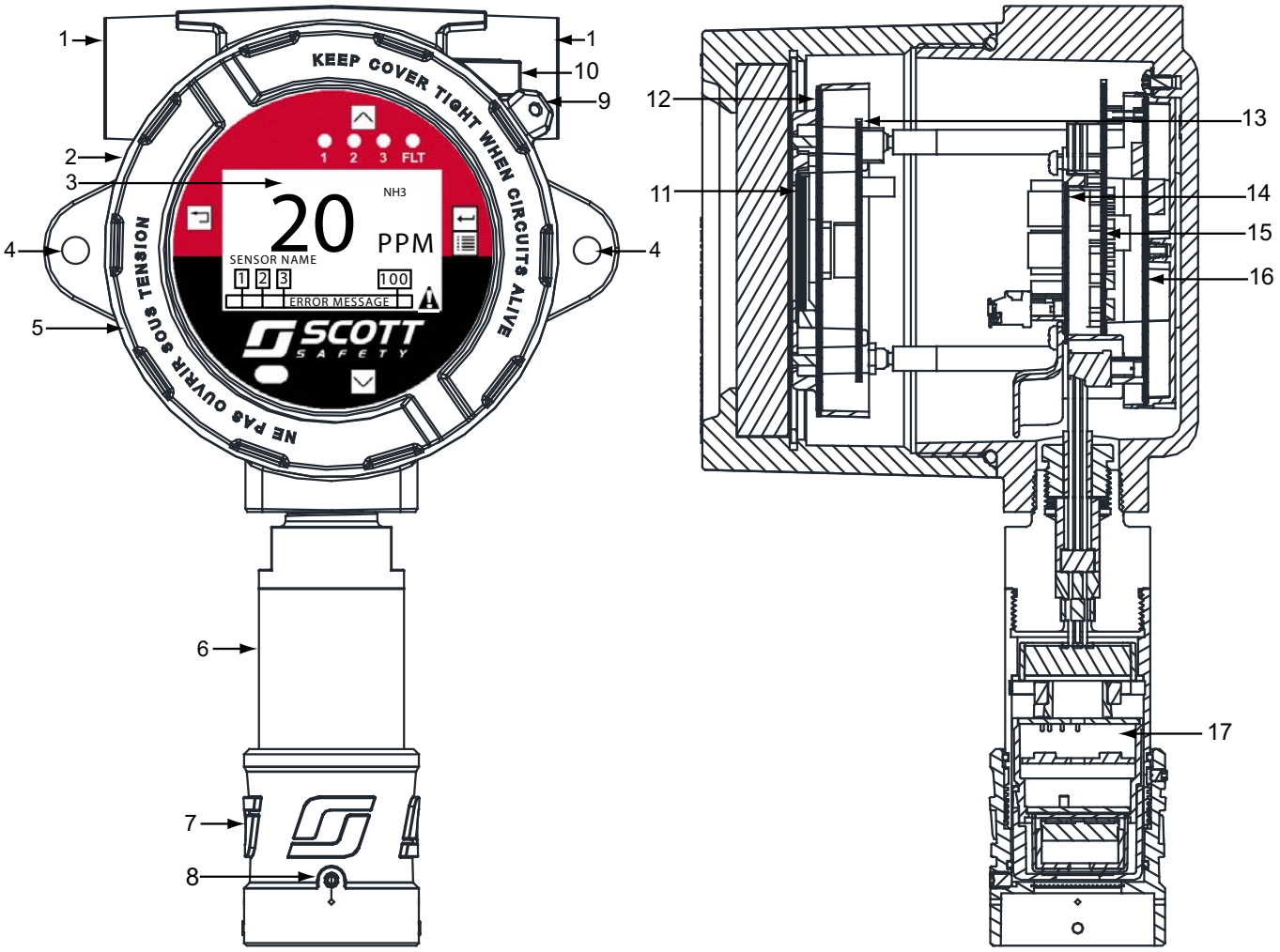


Table 13 lists the major parts of the device.

Table 13 Major Parts

REFERENCE NUMBER	ITEM
1	3/4” NPT Conduit Entries (2)
2	Housing
3	Display (LCD)
4	Mounting Flange Holes (2)
5	Removable Cover
6	Meridian Detector Body less Meridian End Cap
7	Meridian End Cap
8	Calibration Port

Table 13 Major Parts (continued)

REFERENCE NUMBER	ITEM
9	Grounding\Earthing Screw
10	Lid Setscrew
11	Display PCB (Optional LCD Heater available for 3-4 Wire PCB only)
12	CPU PCB
13	Optional Communication Expansion Card (CEC) PCB available for 3-4 Wire (one per device). Contact your Scott sales representative for available PCBs.
14	Terminal/Relay/MODBUS RS-485 PCB for 3-4 Wire (4 Relays, 3-4to20mA (one for each Sensor) and 1 Remote Acknowledge Alarm)
15	Power Supply PCB available (select one): • Power Supply PCB (for 3-4 Wire Isolated 4-20mA) (converts 10-30VDC to 3.3VDC, 12VDC, adjustable 2to9VDC Sensor voltage) • Power Supply PCB (4-20mA for 2 Wire applications)
16	Intrinsically Safe Barrier PCB available (select one): • 3-4 Wire Intrinsically Safe Barrier PCB • 2 Wire Intrinsically Safe Barrier PCB
17	Sensor Assembly

Chapter 3

SCOTT INSTALLATION

Chapter Overview

This chapter covers the following topics:

- Planning for Installation
- Installation Checklist

Planning for Installation

This section provides the pre-installation items.

Verifying Items Shipped

This section provides a list of the items that ship with the device. Ensure you have all items, if not See "Technical Service" on page 158.

- Device
- Magnet Tool
- CD
- Quick Reference User Notes

Sensors are packaged separately.

Mounting Considerations

This section outlines a few variables that should be taken into consideration when selecting a location for mounting the device:

Each application is unique and needs to be assessed. These are only general guidelines.

- Orientation – For Rock Solid sensors only, always mount the device's sensor pointing downwards.

Caution: *Never mount the detector in a way that causes the sensor to be pointing upwards. Failure to do so can result in poor sensor performance.*

- Gas Density – Some gases rise and some sink depending on their Gas Density relative to air. For gases heavier-than-air, it is recommended that the sensor be installed near the floor. In these applications, care should be taken to protect the sensors from physical damage. For gases that are lighter-than-air, the sensor should be placed near the ceiling, above the potential source of the leak, as well as at the highest point in the room if it is an indoor application. For gases with densities equal-to-air, mount as close to potential leak source as practical, or near or at breathing level. Table 14 provides various gas densities for Combustibles (LEL) and Table 15 provides various gas densities for Toxic (E-Chem).

Ensure you consult the CAS Registry Database (cas.org) for the latest and most current information. These tables are for reference only and not meant to be the most update source of information. The content of these tables were derived from the CAS Registry. Additionally, review the applicable MSDS.

Remote Calibration Fittings are available. See "Parts List" on page 160.

Table 14 Gas Density Relative to Air and CAS No. - Combustibles (LEL)

GAS	SYMBOL	CAS NO.	VALUE
Acetone	CH_3COCH_3	67-64-1	2.0
Ammonia	NH_3	7664-41-7	0.6
Benzene	C_6H_6	71-43-2	2.7
1,3-Butadiene	CH_2=CH-CH=CH_2	106-99-0	1.9
Butane	$CH_3(CH_2)_2CH_3$	106-97-8	2.0
Carbon Monoxide	CO	630-08-0	1.0
Cyclohexane	C_6H_{12}	110-82-7	2.9
Ethane	C_2H_6	74-84-0	1.0
Ethanol	C_2H_5OH	64-17-5	1.6
Ethylene	CH_2=CH_2	74-85-1	1.0
Ethylene Oxide	C_2H_4O	75-21-8	1.5
Heptane	C_7H_6	142-82-5	3.5
Hexane	C_6H_{14}	110-54-3	3.0
Hydrogen	H_2	1333-74-0	0.1
Hydrogen Sulfide	H_2S	7783-06-4	1.2
Isobutylene	$CH_3C(CH_2)CH_3$	115-11-7	1.9
Isopropyl Alcohol	$CH_3CH(OH)CH_3$	67-63-0	2.1
Methane	CH_4	74-82-8	0.6
Methanol	CH_3OH	67-56-1	1.1
Methyl Ethyl Ketone	CH_3-CO-C_2H_5	78-93-3	2.5
Methyl Mercaptan	CH_3SH	74-93-1	1.7
Octane	C_8H_{18}	111-65-9	3.9
Pentane	C_5H_{12}	109-66-0	2.5
Propane	C_3H_8	74-98-6	1.5
Propylene	CH_3CH=CH_2	115-07-1	0.8
Toluene	$C_6H_5CH_3$	108-88-3	3.2
o-Xylene	$C_6H_4(CH_3)_2$	95-47-6	3.7
Note: Vapor densities (Air= 1.0 atmosphere @25°C). Therefore, values <1 raise and values >1 sink.			

Table 15 Gas Density Relative to Air and CAS No. - Toxic (E-Chem)

GAS	SYMBOL	CAS NO.	VALUE
Ammonia	NH_3	7664-41-7	0.6
Arsine	AsH_3	7784-42-1	2.7
Boron Trichloride	BCl_3	10294-34-5	6.1
Bromine	Br_2	7726-95-6	5.5
Carbon Dioxide	CO_2	124-38-9	1.5
Carbon Monoxide	CO	630-08-0	1.0
Chlorine	Cl_2	7782-50-5	2.4
Chlorine Dioxide	ClO_2	10049-04-4	2.3
Diborane	B_2H_6	19287-45-7	1.0
Dichlorosilane	SiH_4Cl_2	4109-96-0	3.5
Fluorine	F_2	7782-41-4	1.3
Germane	GeH_4	7782-65-2	2.6
Hydrogen	H_2	1333-74-0	0.1
Hydrogen Chloride	HCl	7647-01-0	1.3
Hydrogen Cyanide	HCN	74-90-8	0.9
Hydrogen Fluoride	HF	7664-39-3	0.7
Hydrogen Selenide	H_2Se	7783-07-5	2.8
Hydrogen Sulfide	H_2S	7783-06-4	1.2
Methanol	CH_3OH	67-56-1	1.1
Methylene Chloride	CH_2Cl_2	75-09-2	2.9
Methyl Iodide	CH_3l	74-88-4	4.9
Nitric Oxide	NO	10102-43-9	1.0
Nitrogen Dioxide	NO_2	10102-44-0	1.6
Nitrogen Trifluoride	NF_3	7783-54-2	2.5
Oxygen	O_2	7782-44-7	1.1
Ozone	O_3	10028-15-6	1.7
Phosphine	PH_3	7803-51-2	1.2
Silane	SiH_4	7803-62-5	1.1
Sulfur Dioxide	SO_2	7446-09-5	2.2
Note: Vapor densities (Air= 1.0 atmosphere @25°C). Therefore, values <1 raise and values >1 sink.			

- Potential Gas Sources – The location and nature of potential vapor/gas sources (e.g., pressure, amount, source, temperature, and distance) need to be assessed. Locate the device where air currents are most likely to contain the highest concentration of escaping gas.

- Ambient Temperature – Ensure that the device is located within an area that complies with the specified operating temperature range. See “Specifications” on page 129.
- Vibration – Mount the device in a manner that minimizes vibration.
- Gas release temperature – Evaluate the behavior of the gas when it is cooled or heated when released. For example, some heated heavier-than-air gases, such as hydrogen sulfide, rise when first released, but settles as they cool and their density increases above that of air.
- Accessibility – Consider future maintenance and calibration requirements.
- Ingress and Egress – Consider passing traffic areas regarding items like personnel, forklifts, motor vehicles, mobile hoists and the like.
- Avoid water and condensing humidity – Water inside the infrared optics adversely affects performance. Avoid mounting in locations where water can collect or splash on the sensor head. Scott Safety recommends a rain shield for outdoor installations.
- Electromagnetic Fields – Although the device is designed to be RFI/EMI resistant, mounting the device near power transformers, walkie-talkies, or other strong EM fields may cause undesirable results. Avoid strong EM fields.
- Use conduit seals and drain loops – Explosion proof conduit and other materials required for electrical wiring in hazardous areas should be installed in accordance with National Electrical Code (NEC) and Canadian Electrical Code (CEC) requirements. All conduit connections should be sealed and contain a drain loop to protect the device electronics from moisture.
- Avoid direct bold sunlight – Scott Safety recommends using a sun shield if the device is mounted in direct sunlight. See “Parts List” on page 160.
- Environmental damage – Every effort should be made to protect sensors from environmental damage caused by water, snow, shock, vibration, dirt, and debris.
- Air variables – Factors such as air movement, gas density in relation to air, emission sources, gas interferences and environmental variables should be considered when determining the correct device location. Air movement by fans, prevailing winds, exhaust duct, strong air-flow through a room, and convection should be carefully evaluated to determine if a leak is more likely to raise gas levels in certain areas within the facility. High air velocities results in inaccurate measurement and reduce sensor life.
- Distance – All systems that separate the Transmitter from the Sensor have distance limit specifications. Ensure that the application’s distance requirements are within specifications and that the appropriate gauge wiring is used.

Following Electrical Codes

This section provides information about adhering to electrical codes when installing the device.

Warning: *To avoid an explosion or electrical fire, encase the cable connection to the device in conduit. The conduit must meet prevailing electrical codes for hazardous-area installations which specify conduit sealing, explosion-proof fittings, and special wiring methods. Failure to do so could result in injury or death.*

Warning: *Ensure to connect the Ground Wire to the device's Grounding Screw on its housing.*

- For North America installations:
  - To meet prevailing electrical codes, use conduit and all other materials required for electrical wiring in hazardous areas. Install wiring according to National Electrical Code (NEC) Articles 501-517.
  - As supplied, the Sensor Head wiring is already sealed and requires no additional sealing to conform to NEC requirements for explosion-proof installations, as long as the detector is mounted no further than 18" (457 mm) from the device [NEC Article 501-5(a)(1)].
- For International installations:
  - Ensure installation meets prevailing electrical codes or standards for hazardous-area installations. For example, IEC/EN 60079-14 standard.

Hard Wired Configurations

This section covers hard wired configurations.

Table 16 lists, and Figure 2 shows some typical hard wired configurations. Table 17 and Table 18 lists the Sensor types allowed.

Table 16 Hard Wired Configurations — Typical

WIRING*	2 WIRE POWER SUPPLY PCB (4-20MA)	TERMINAL /RELAY/MODBUS RTU (RS-485) PCB	OPTIONAL COMM. PCB	LOCAL INTEGRAL SENSOR	LOCAL MULTIPLE SENSORS ***	REMOTE SENSOR(S) ****	REMOTE SENSOR DISTANCE *****	NUMBER OF SENSORS/ TRANSMITTER	SENSOR TYPE
3-4 Wire	N/A	Yes	1**	No J-Box	J-Box	J-Box	100'	Up to 3	See Table 17.
2 Wire	Yes	No	N/A	No J-Box	J-Box	J-Box	100'	1	See Table 18.

* Power Consumption vary. See "Device Specifications" on page 130.
** System allows only one Comm PCB. Consult Scott for available options.
*** Use the Seal when exiting the Device.
**** Allows different location of Sensor based on gas properties.
***** The distance is between a transmitter and any sensor. See "Device Specifications" on page 130.

Table 17 Hard Wired Configurations — Sensor Types Supported for 3-4 Wire

SENSOR #1	SENSOR #2	SENSOR #3
E-Chem*	E-Chem	E-Chem
	O_2	E-Chem
	O_2	O_2
O_2 (096-3473-19)	E-Chem	E-Chem
	O_2	E-Chem
	O_2	O_2
Combustible Cat-Bead (096-3473-55)	E-Chem	E-Chem
	O_2	E-Chem
	O_2	O_2
MOS (096-3473-57)	E-Chem	E-Chem
	O_2	E-Chem
	O_2	O_2
IR - CO_2 (096-3473-58)	STOP	STOP
	O_2	STOP
	STOP	STOP
Combustible IR (096-3473-56)	STOP	STOP
	O_2	STOP
	STOP	STOP
* E-Chem Sensor P/Ns 096-3473-01 thru 096-3473-18 and 096-3473-20 thru 096-3473-54 and Sensor Simulator 096-3395 only. Simulator is for temporary use only. Note: 3-4 Wire transmitter allowed sensor combinations, used only with IS barrier assembly 096-3448.		

Warning: *STOP. Do not use these combinations under any circumstances. They are not intrinsically safe and can cause explosion.*

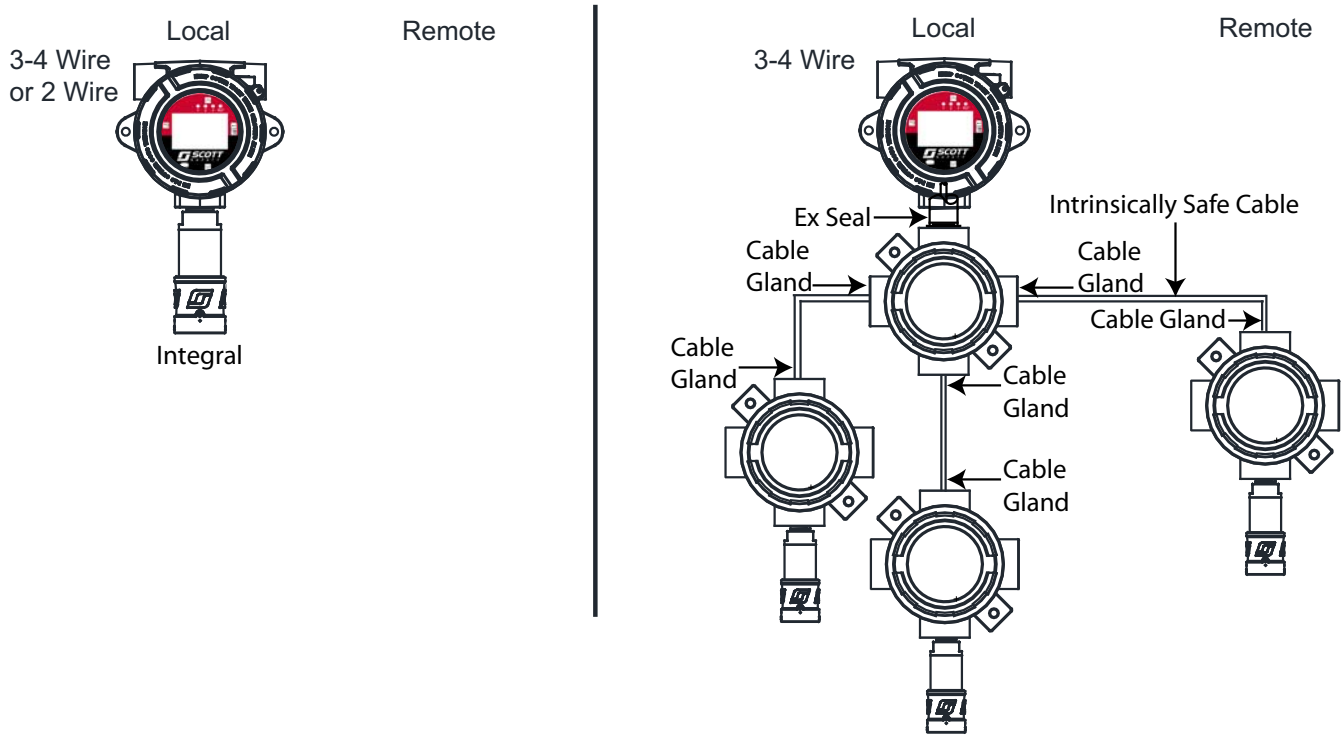
Warning: *Illegal Configuration - Not Intrinsically Safe. Sensor configuration rules are violated or are attempted, the device automatically goes into an immediate fault mode. Failure to adhere to this could result in injury or death.*

Table 18 Hard Wired Configurations — Sensor Types Supported for 2 Wire

SENSOR #1
E-Chem - E-Chem Sensor P/Ns 096-3473-01 thru 096-3473-18 and 096-3473-20 thru 096-3473-54 and Sensor Simulator 096-3395 only. Simulator is for temporary use only. Note: 2 Wire transmitter allowed sensor combinations, used only with IS barrier assembly 096-3449.
O_2 (096-3473-19)

Warning: *Illegal Configuration - Not Intrinsically Safe. Sensor configuration rules are violated or are attempted, the device automatically goes into an immediate fault mode. Failure to adhere to this could result in injury or death.*

Figure 2 Hard Wired Sensor Configurations — Typical



Note: Intrinsically Safe Cable distance from Transmitter to any Sensor is 100Ft. (30.48m) Maximum.
Reference control drawings: 096-3506-B for 3-4 Wire and 096-3507-B for 2 Wire.

These are examples of typical configurations. Other combinations exist.

Determining Wire Length and Size for Input Power

This section provides key factors to determine wiring distance. You must determine the proper wire length and size so the proper Voltage gets from the source to the destination. If the proper Voltage is not at the destination, then the device will not function properly. This is referred to as Voltage Loss and must be planned for when installing.

Figure 3 provides a formula to calculate the maximum wire length that can be used.

Figure 3 Maximum Wire Length Formula

$$D_{ir} = \frac{V\ PowerSupply - V\ Min}{I_{Max} \times R_{Wire} \times 2}$$

Where:

D_{ir} = Maximum wire length in feet based on the wire's loop voltage

$V_{PowerSupply}$ = Power supply output voltage

V_{Min} = Minimum current voltage of device

I_{Max} = Maximum current in amperes

R_{Wire} = Resistance of wire in Ohms/foot

To determine the maximum wiring distance, first calculate the wiring's maximum allowable voltage drop by subtracting the device minimum operating voltage from the power supply's output voltage. Then, use the appropriate chart to determine the maximum wiring distance. See Table 19.

Table 19 Typical Cable Data for Input Power Length Considerations

CABLE SIZE (AWG)	CABLE SIZE (MM^2)	CONDUCTOR CROSS SECTION AREA (MM^2)	RESISTANCE (OHMS/FOOT)	RESISTANCE (OHMS/METER)
22	0.50	0.33	0.0158	0.0518
20	0.60	0.50	0.0112	0.0367
18	0.90	0.82	0.0077	0.0253
16	1.5	1.50	0.0039	0.0127
14	2.5	2.00	0.0026	0.0085
12	4.0	3.30	0.0016	0.0054
10	6.0	5.26	0.0010	0.0034
Note: Maximum allowable voltage drop can be calculated based on power supply output voltage and the device minimum voltage and maximum current requirements. For 3-4 Wire= 10VDC* Min. input, for 2 Wire= 18VDC* Min. input. *These values are subject to change.				

Warning: *Install according to applicable Intrinsically Safe wire practice or standards. For example, IEC/ECN 60079-14.* See Table 19.

Determining Wire Length for RS-485 Cable

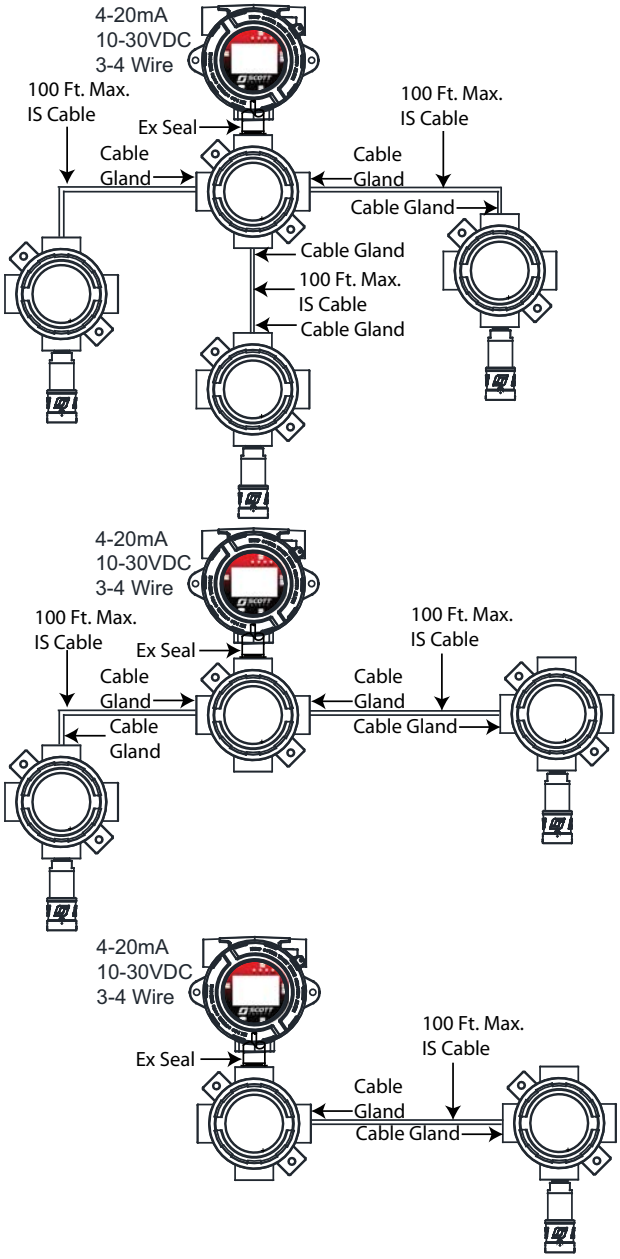
This section provides the maximum RS-485 wiring distance.

Supports 1,200Meters maximum @19.2Kbs using Belden 9841 twisted-pair cable.

Determining Wire Length for Remote Sensors

This section provides some examples of the maximum wire length for remote sensors. See Figure 4. See "Parts List" on page 160.

Figure 4 Remote Sensor Wire Length – Examples



Note: Intrinsically Safe Cable distance from Transmitter to any Sensor is 100Ft. (30.48m) Maximum.
Reference control drawings: 096-3506-B for 3-4 Wire and 096-3507-B for 2 Wire.

An Application Solution Example

This section provides an example of an application solution based on some specific requirements. See Table 20 and Figure 5.

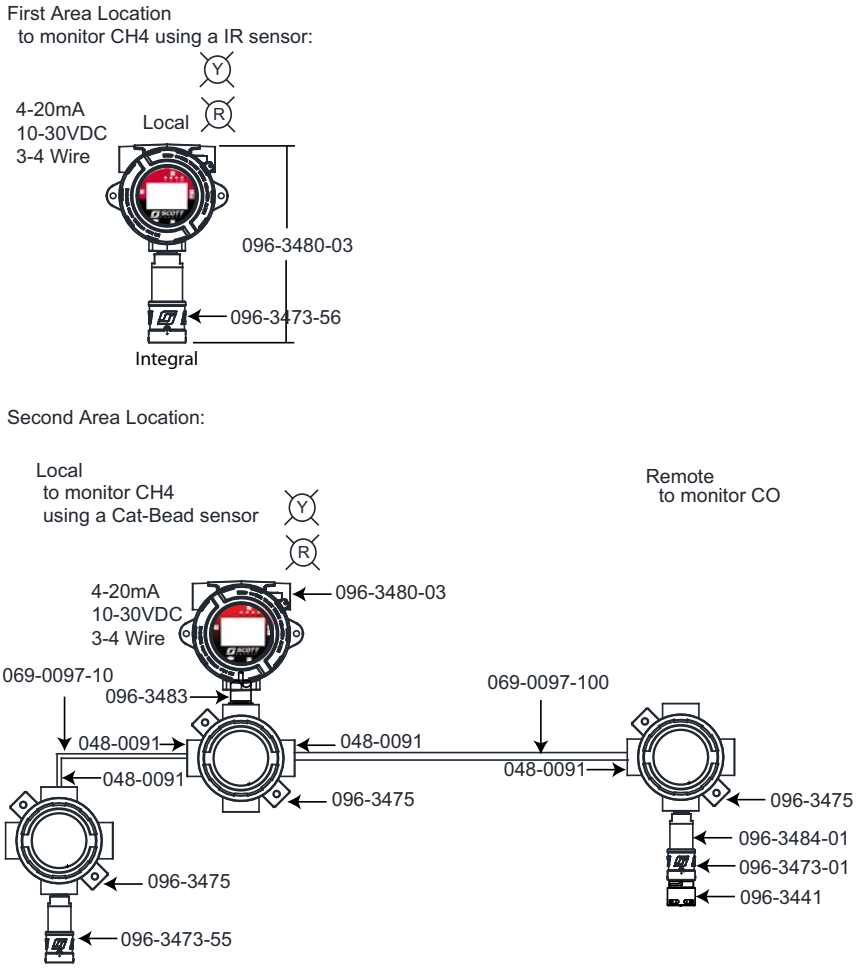
Application Requirements:

- In first location, need to monitor for Methane (CH_4) at a one location, different area than the others, and must be extremely accurate and highly stable.
- In second location, need to monitor for both CO and Methane (CH_4) about 110Feet away total.
- Site is in Canada, thus must meet Canadian CSA approval.
- Need to protect the CO Sensor from wash downs in that area.
- Need to hook up some field lights at the two locations.

Table 20 Parts Required for Application Solution Example

REQUIREMENT	DESCRIPTION	P/N	QTY
Monitor three gases, at local and remote locations, meet CSA temperature (-40C), hook up field lights. Thus, need the 3-4 Wire device with heated LCD, has relay PCB for using field devices. Need two, since one Methane must be very accurate, which requires an IR sensor technology and has higher power requirements.	3-4 Wire, Al, heated, plastic Meridian End Cap, Canada	096-3480-03	2*
Monitor CO	CO Sensor (E-Chem)	096-3473-01	1
Monitor Methane	Methane Sensor (LEL) Cat-Bead	096-3473-55	1
Monitor Methane with high accuracy and stability	Methane Sensor Combustible (LEL) IR	096-3473-56	1
Protect CO Sensor from wash down activity	1/4 Turn Deluge-Wash Down Fitting	096-3441	1
Accommodate the remote locations of the Combustible (LEL) Cat-Bead Methane Sensor, and the CO (E-Chem) Sensor, you need the following: IS Cables with lengths to the point of gas detection for the two sensors. For each point in and out of each Meridian Junction Box Assembly you need a Remote Cable Gland Fitting	Meridian Junction Box Assembly IS Cable (10Feet) IS Cable (100Feet) Remote Cable Gland Fitting	096-3475 069-0096-10 069-0096-100 048-0091	3 1 1 4
Accommodate the remote location of the CO sensor	Meridian Detector Body Assembly, 3-4 Wire, plastic Meridian End Cap	096-3484-01	1
For IS compliance, Meridian NPT Ex Seal between the Transmitter and the Meridian Junction Box Assembly	Meridian NPT Ex Seal	096-3483	1
* To meet these specific requirements, we are going to get two 096-3480-03 and then remove the Meridian Detector Body and place one at the remote location for the CO sensor.			

Figure 5 Application Example



Note: Intrinsically Safe Cable distance from Transmitter to any Sensor is 100Ft. (30.48m) Maximum.
Reference control drawings: 096-3506-B for 3-4 Wire and 096-3507-B for 2 Wire.

This is only one example. The system solution varies on a case to case basis based on the application variables and its objectives. Therefore, for each application, please contact your Scott sales representative.

Installation Checklist

This section provides the installation requirements. Table 21 lists the individual items.

Warning: *Only qualified personnel should perform the installation according to applicable electrical codes, local regulations, and safety standards. Failure to do so could result in injury or death. Qualified personnel as defined according to local, county, state, federal, national and individual company standards.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting any of the procedures.*

Table 21 Installation Checklist

ITEM	DETAILS
Device Aluminium and Stainless Steel	See “Mounting the Device” on page 26.
Device Retrofit Mounting Plate	See “Installing the Retrofit Mounting Plate” on page 26.
Meridian NPT Ex Seal	See “Installing the Meridian NPT Ex Seal” on page 28.
Meridian Junction Box Assembly (Aluminum and Stainless Steel)	See “Mounting and Wiring the Meridian Junction Box Assembly (Al or SS)” on page 31.
Meridian Junction Box Assembly Spacer Kit	See “Using the Meridian Junction Box Assembly Spacer Kit” on page 33.
Duct Mount Fitting (both Flat and Round) for Meridian Detector Body	See “Mounting a Meridian Detector Body Using a Duct Mount Fitting” on page 34.
3 Wire Connections from the VDC Power Supply and Receiver to the Device	See “Connecting the Device to the Power Supply and Receiver – 3 Wire” on page 36.
2 Wire Connections from the VDC Power Supply to the Device	See “Connecting the Device to the Power Supply – 2 Wire” on page 39.
4 Wire Connections from the VDC Power Supply and Receiver to the Device	See “Connecting the Device to the Power Supply and Receiver – 4 Wire” on page 40.
Connections from the Device to Various Scott Receivers (Controllers)	See “Connecting from the Device to Scott Receivers” on page 44.
Relays and Remote Alarm on the Terminal/Relay/MODBUS RS-485 PCB	See “Connecting Relays & Remote Alarm Reset” on page 44.
Connections for MODBUS RS-485	See “Connecting MODBUS RS-485” on page 46.
Optional Communication Expansion Card (CEC) PCB	See “Installing the Optional Communication Expansion Card (CEC) PCB” on page 48.
Sensor Head	See “Connecting the Sensor Head” on page 49.
Sensor	See “Installing/Replacing a Sensor” on page 50.

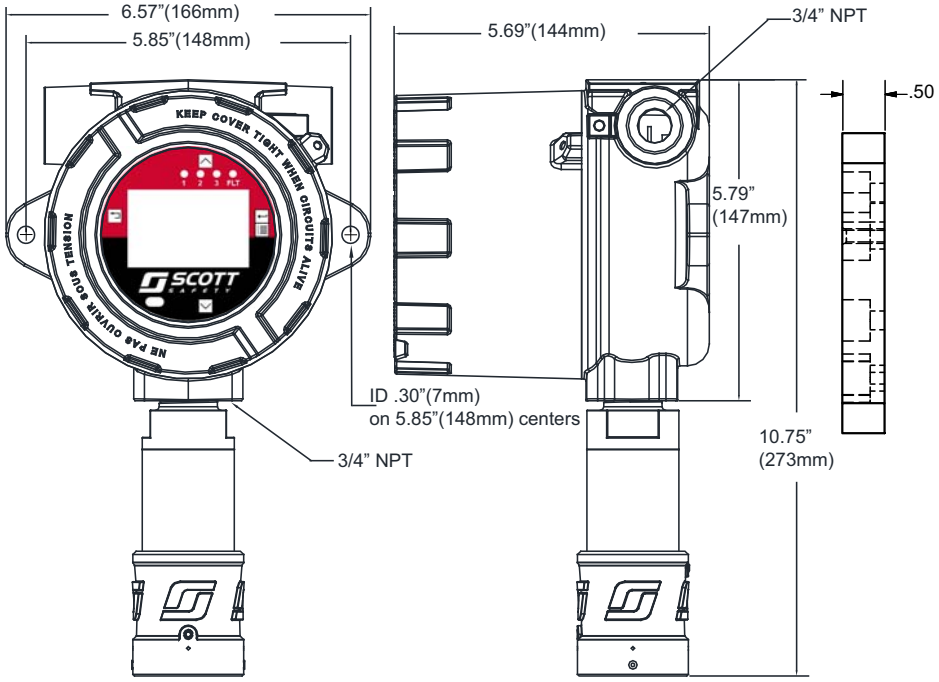
Mounting the Device

This section describes how to mount the device.

Install the device to a wall or bracket using the Predrilled Mounting Flanges (that is part of the housing). To facilitate wiring to the device enclosure, two-threaded 3/4” NPT conduit fittings are provided. See Figure 6.

Do not attempt to mount the device using only the conduit.

Figure 6 Device Mounting Dimensions - Aluminum & Stainless Steel



Installing the Retrofit Mounting Plate

This section describes installing the Retrofit Mounting Plates. The plates are used when you are mounting the device where a previous mounted Scott transmitter was located and it allows for easier access to the Meridian End Cap. See Figure 7 and Figure 8.

Figure 7 Retrofit Mounting Plate Dimensions - Al

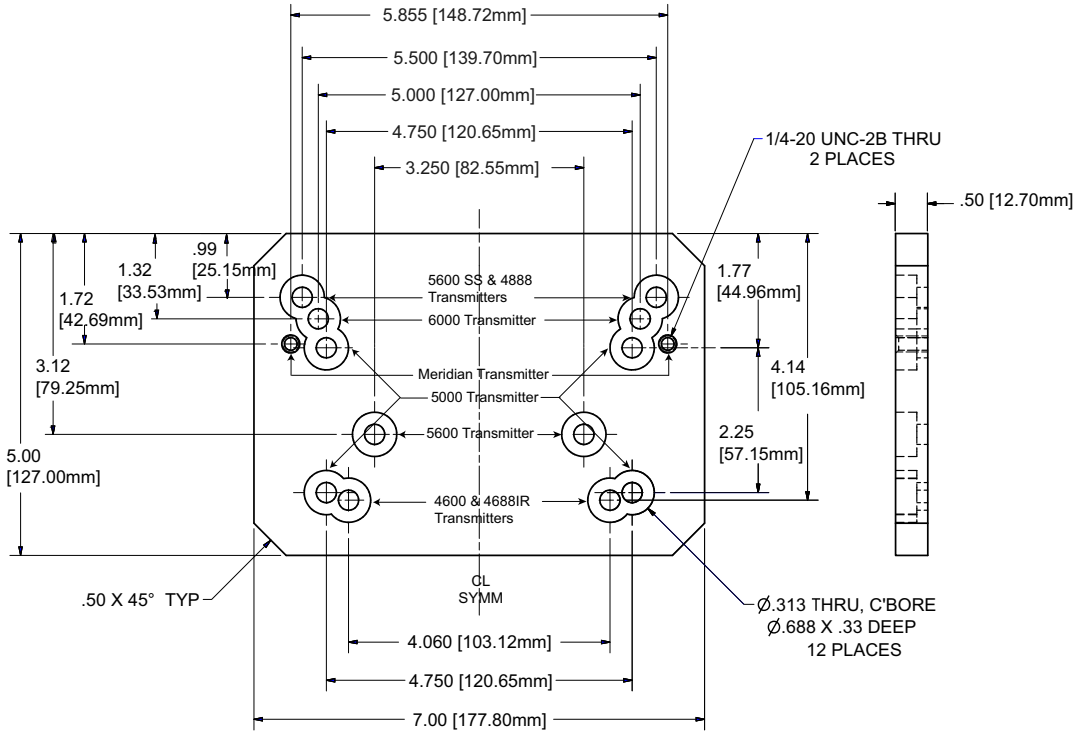
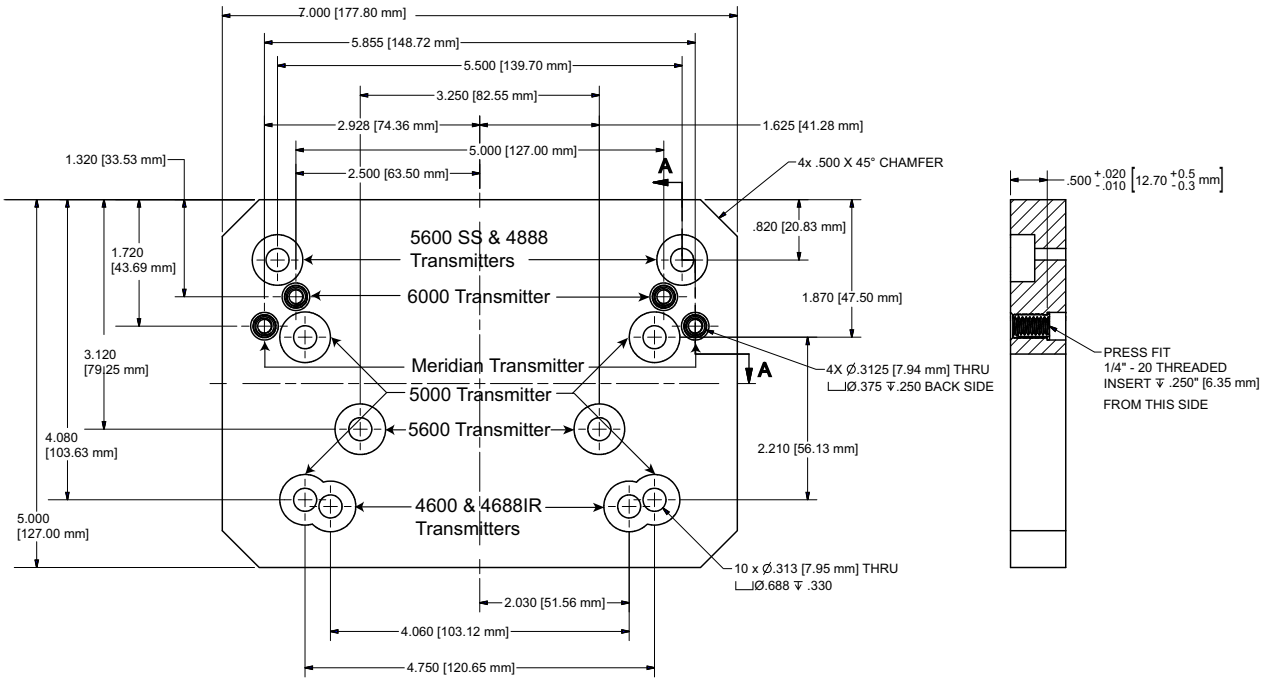


Figure 8 Retrofit Mounting Plate Dimensions - HDPE



Installing the Meridian NPT Ex Seal

This section describes installing the Meridian NPT Ex Seal between the device and a Meridian Junction Box Assembly in the field. It is used to maintain the Explosion Proof/Flame Proof integrity of the enclosure and is installed between the housings. See Figure 9.

This procedure is only necessary if you did not originally order the device configured in this manner from the factory.

***Warning:** Ensure Receivers and Power Supplies are not powered when installing PCB into the device. Failure to do so could result in injury or death.*

***Warning:** Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1. Ensure Receivers and Power Supplies are not powered when installing wire to the device.
2. Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.
3. Remove the two (2) wires from the 10-30VDC TB1.

It is not necessary to remove the Wire Ribbon Cable from the upper and lower PCB stack.

4. Disconnect the top pluggable portion of the terminal blocks in use (MODBUS, Alarms, Fault, and Remote Acknowledge).
5. Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.
6. Unscrew the two (2) screws and remove the Intrinsically Safe (IS) Terminal Block (TB) Cover.
7. Unscrew the two (2) retention screws on the Blue IS Terminal Block then remove the top plug-able portion of the terminal block.

The Blue IS Terminal Block's two (2) retention screws prevent accidental dis-lodging of the connections.

8. If a Meridian Detector Body Assembly was installed to the device, then unscrew the six (6) screws on the light blue IS TB and remove the six (6) wires from the TB.
9. If a Meridian Detector Body Assembly was installed to the device, then remove the Meridian End Cap, Sensor and the Sensor Assembly.
10. Pull the six (6) wires on top of the Meridian NPT Ex Seal into the device's 3/4" NPT hole.
11. Screw the Meridian NPT Ex Seal into the device.

When installing the Meridian NPT Ex Seal, thread into the 3/4" NPT hole, hand tighten, then tighten an additional minimum of one and a half turns. Care should be taken not to twist or damage wires while threading in fitting.

Warning: *To maintain Explosion Proof/Flame Proof a minimum of 5 threads of engagement is required. Failure to do so could result in injury or death.*

12 Insert the six (6) wires into the light blue IS TB and screw them down. See "Connecting the Sensor Head" on page 49.

13 Replace the IS Terminal Block Cover and tighten the two (2) screws.

14 Ensure the top of all your applicable plugs with feeding wires are easely accessible prior to replacing the PCB stack to ease re-plugging.

15 Replace the PCB stack into the housing.

16 Replace the four (4) standoffs.

17 Re-connect the tops of the plugs for any other terminal blocks in use (10-30VDC, MODBUS, Alarms, Fault, and Remote Acknowledge).

18 Replace the two (2) wires to the 10-30VDC TB1.

19 Replace the LCD PCB/CPU PCB set into t he four (4) standoffs and screw the Housing Cover back on.

20 Unscrew the Meridian Junction Box Assembly Cover.

21 Pull the six (6) wires on bottom of the Proof/Flame Proof Seal into the Meridian Junction Box's 3/4" NPT hole.

22 Screw the Junction Box Assembly onto the Meridian NPT Ex Seal.

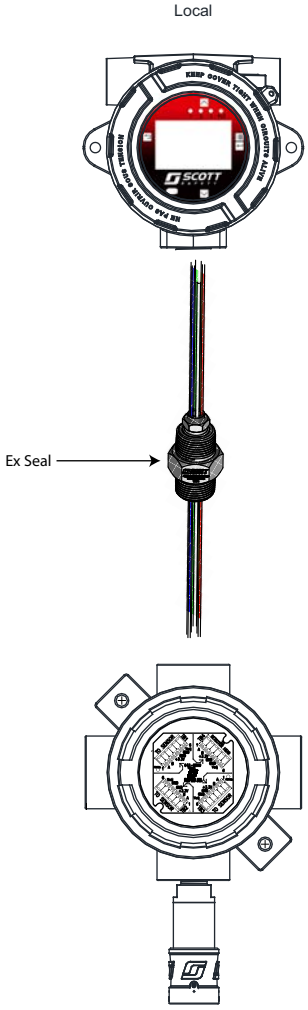
When installing the Meridian NPT Ex Seal, thread into the 3/4" NPT hole, hand tighten, then tighten an additional minimum of one and a half turns.

Warning: *To maintain Explosion Proof/Flame Proof a minimum of 5 threads of engagement is required. Failure to do so could result in injury or death.*

23 Insert the six (6) wires into the light blue TB4 and screw them down. See "Mounting and Wiring the Meridian Junction Box Assembly (Al or SS)" on page 31.

24 Replace the Meridian Junction Box Assembly Cover and secure the setscrew.

Figure 9 Meridian NPT Ex Seal Installation



Mounting and Wiring the Meridian Junction Box Assembly (Al or SS)

This section describes how to mount and wire the Meridian Junction Box Assembly.

If your application requires that the sensor be mounted remotely from the device, ensure you follow all code and regulatory requirements. In a remote application, the wiring distance (the Max. length of the wire) from the sensor to the device must not exceed 100Ft. The sensor might not function if you go over this distance or/and the installation might not be Intrinsically Safe. When desired, conduit must be obtained from your local vendor. See Figure 10 for the Aluminum and Figure 11 for Stainless Steel.

Sensor type does not affect wiring.

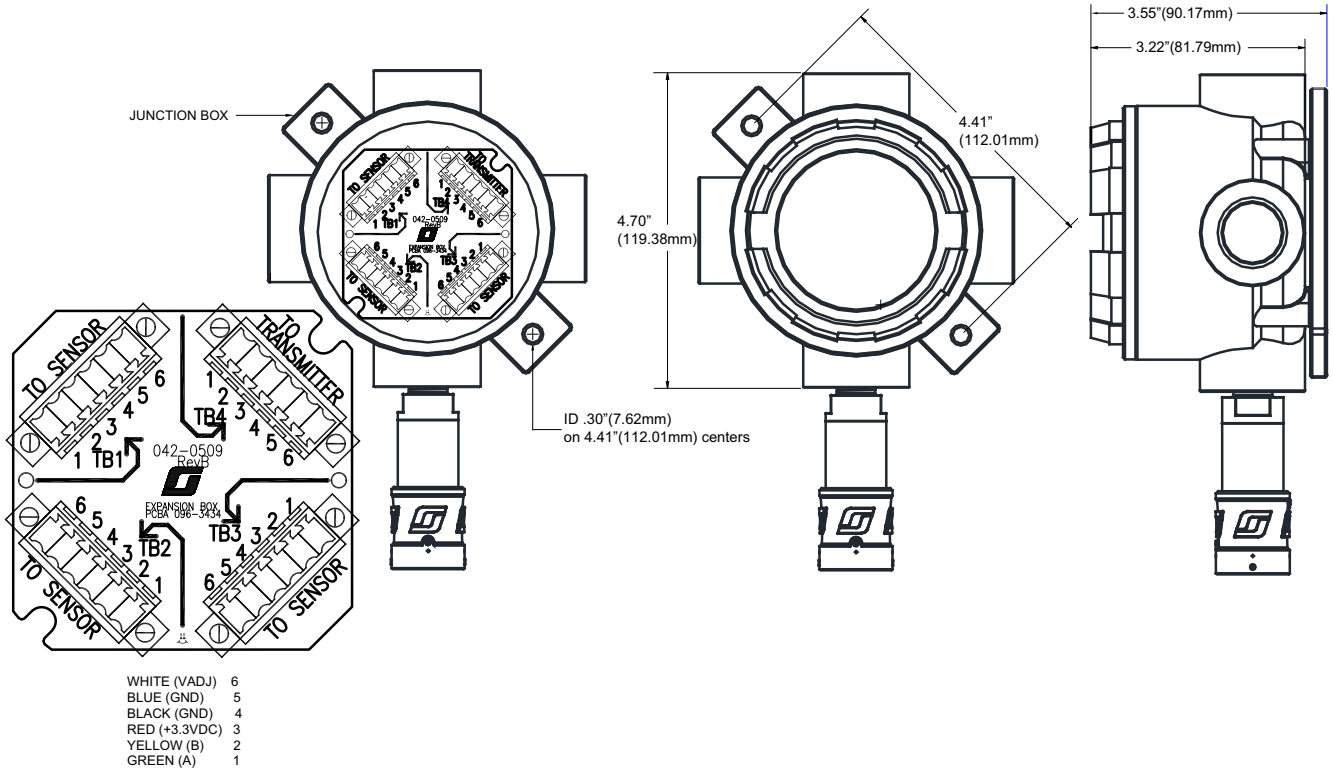
Light blue terminal blocks indicate Intrinsically Safe circuits. Tighten plug retention screws.

***Caution:** Ensure separation between each connection is maintained in accordance with ICE/EN 60079-14 and ICE-EN 60079-11.*

For a 2 Wire device wired to a Meridian Junction Box Assembly, only one (1) Sensor is allowed. Thus, only two (2) TB's are used.

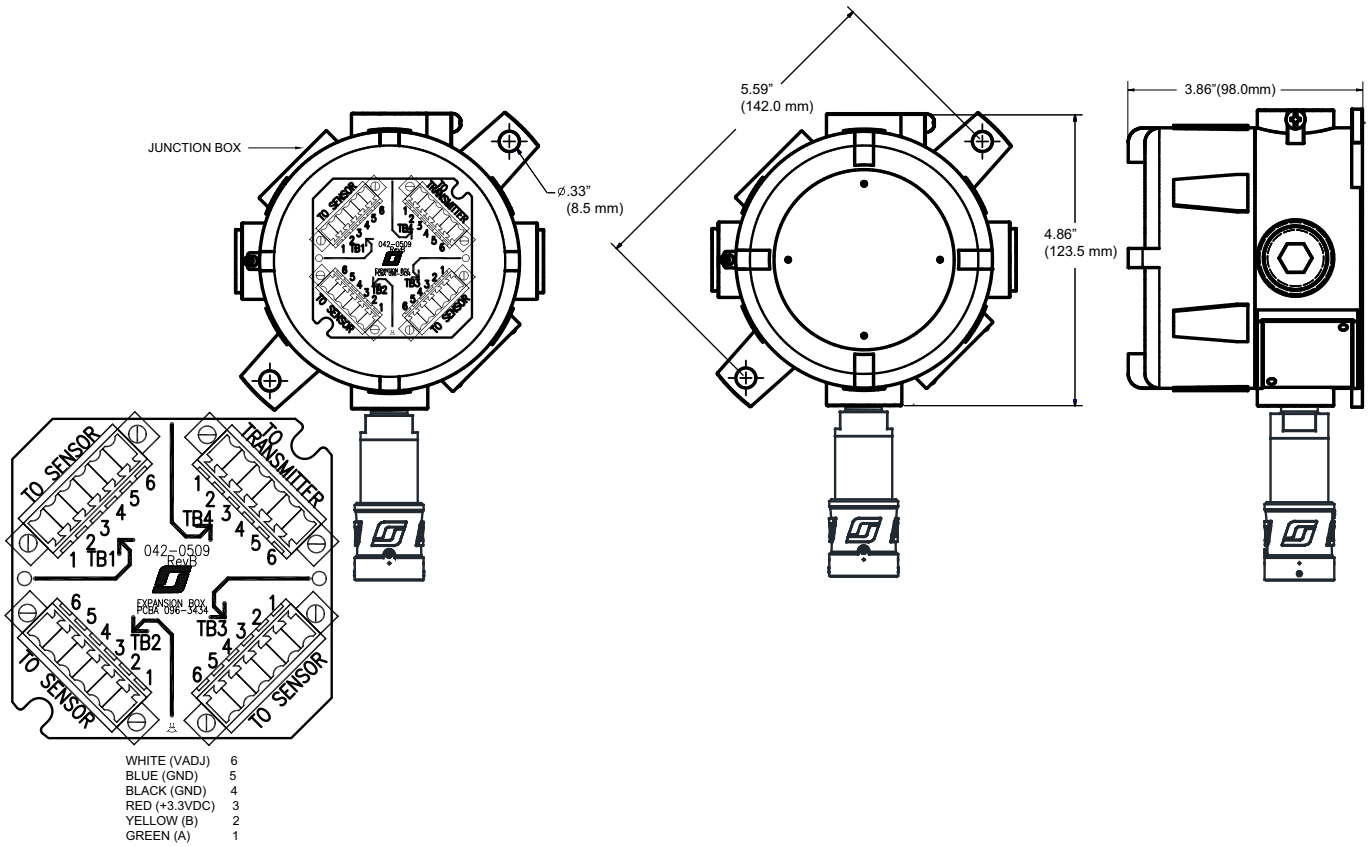
Ensure the Cover is replaced and secure the setscrew.

Figure 10 Meridian Junction Box Assembly Wiring and Mounting – Aluminum



Note: Intrinsically Safe Cable distance from Transmitter to any Sensor is 100Ft. (30.48m) Maximum. Reference control drawings: 096-3506-B for 3-4 Wire and 096-3507-B for 2 Wire.

Figure 11 Meridian Junction Box Assembly Wiring and Mounting – Stainless Steel



Note: Intrinsically Safe Cable distance from Transmitter to any Sensor is 100Ft. (30.48m) Maximum.
Reference control drawings: 096-3506-B for 3-4 Wire and 096-3507-B for 2 Wire.

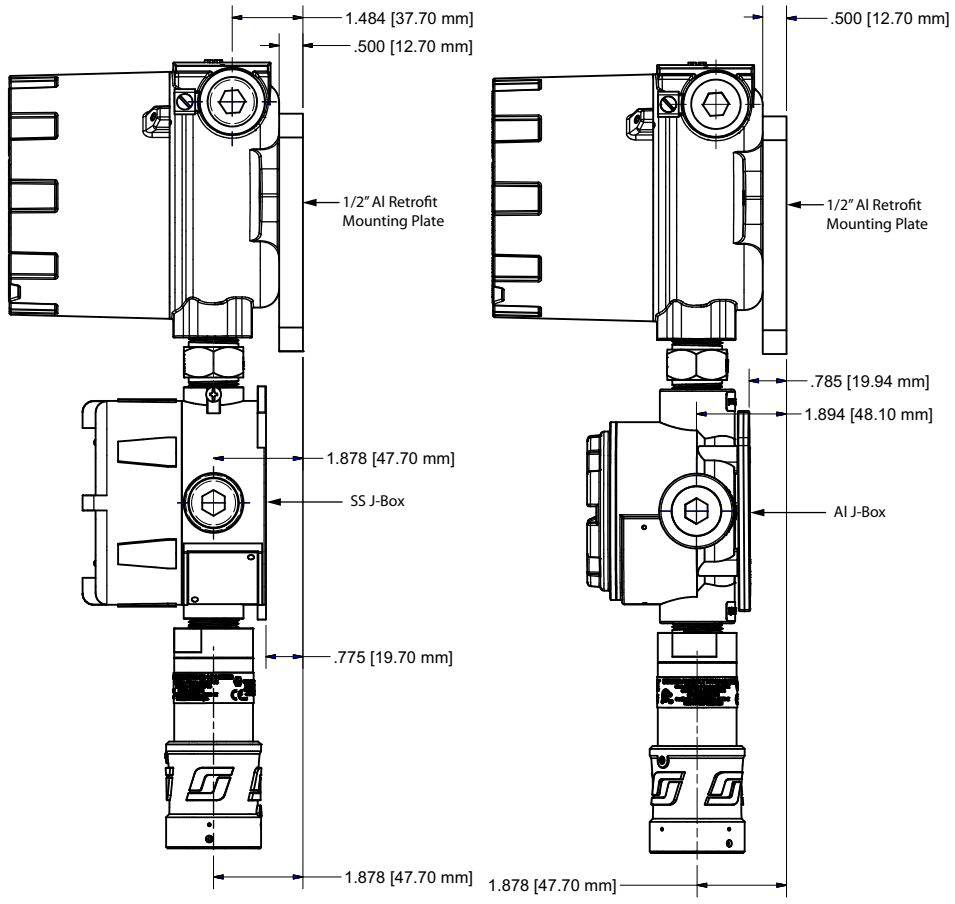
Using the Meridian Junction Box Assembly Spacer Kit

This section covers selecting the proper spacers based on the configuration. See Table 22 and Figure 12.

Table 22 Meridian Junction Box Assembly Spacer Configurations

RETROFIT MOUNTING PLATE BEHIND DEVICE	J-BOX MATERIAL	SPACER
No Retrofit Mounting Plate	Al	2- 5/8”OD x.250”
With 1/2” Al Retrofit Mounting Plate	Al	2- 5/8”OD x.750”
No Retrofit Mounting Plate	SS	2- 5/8”OD x.750”
With 3/4” HDPE Retrofit Mounting Plate	SS	2- 5/8”OD x.750” and 2- 5/8”OD x.250” together for the 1.0” gap

Figure 12 Meridian Junction Box Assembly Spacer Usage



Mounting a Meridian Detector Body Using a Duct Mount Fitting

This section covers the mounting of a Meridian Detector Body using a Duct Mount Fitting.

This mounting method allows the monitoring of airflow in exhaust or ventilation ducts without drying out the device's sensor. For details on Flow Velocities and Duct compatibility. See "Device Specifications" on page 130.

For use only with devices configured for remote sensor and without Meridian Junction Box Assembly.

The Duct Mount Fitting comes in a kit that is used for either Flat and Round applications. Most of the parts in the kit are used in either application. These are the exceptions: one (1) flat washer (2F) is used for flat duct applications, while two (2) curved washers (2C & 6C) are used for round duct applications. Additionally, for round duct applications, you need to curve the plate (4) by hand to conform to different duct shapes.

Ensure you have it assembled properly for your duct application prior to tightening the locking nut. The locking nut digs into the washer for a lasting grip.

See Figure 13 and Table 23.

Figure 13 Duct Mount Fitting Kit

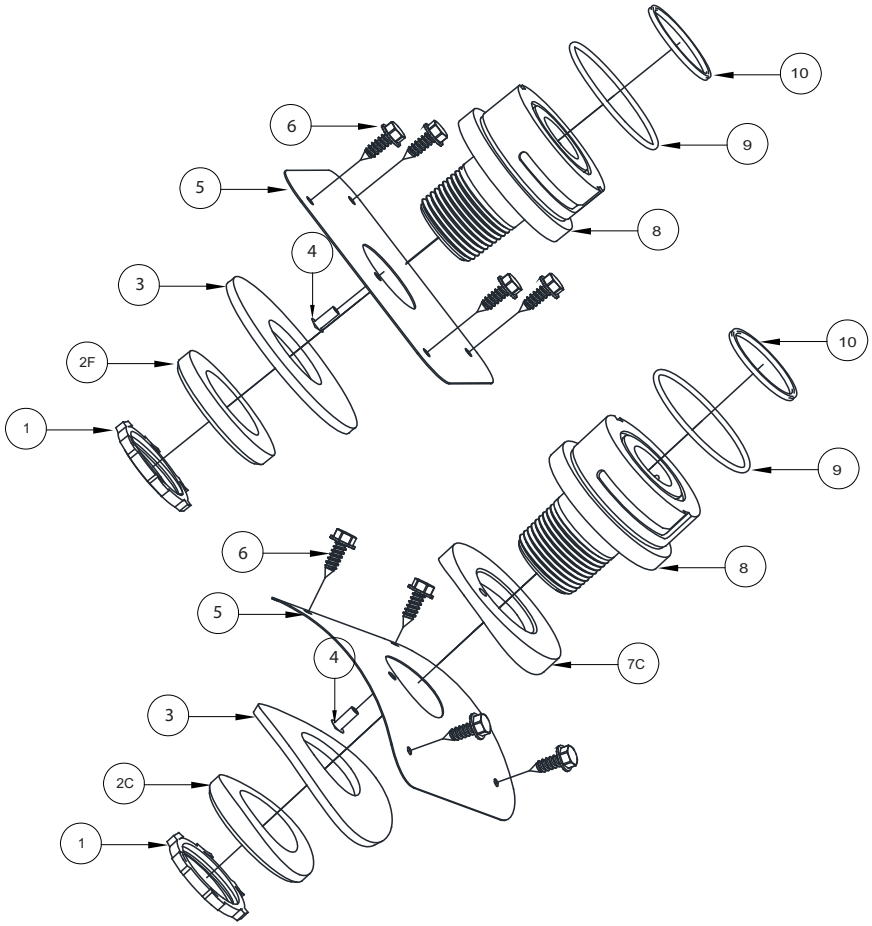
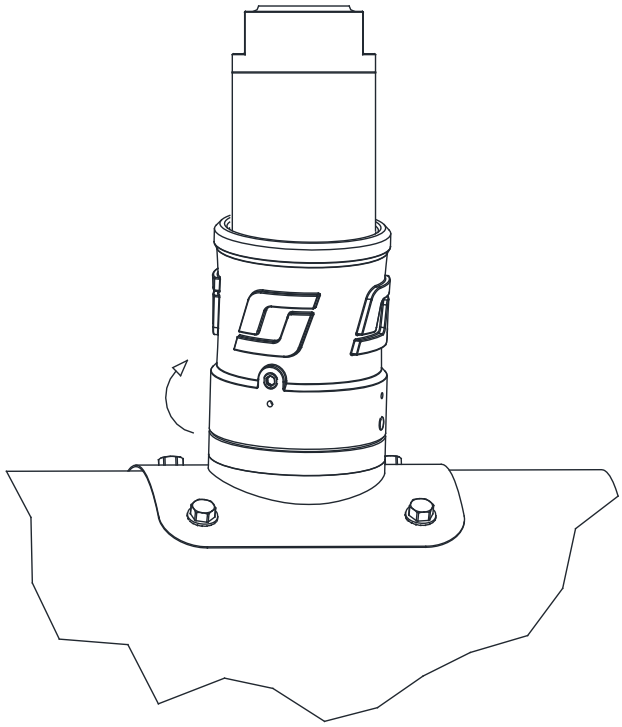


Table 23 Usage of Kit Parts

REFERENCE NUMBER	ITEM	USED
1	Locking Nut	Flat & Round
2F	Flat Washer	Flat
2C	Convex Washer	Round
3	Seal Washer	Flat & Round
4	Rivet	Flat & Round
5	Plate	Flat & Round
6	4 Self-Piercing Sheet Metal Screws	Flat & Round
7C	Concave Washer	Round
8	Body	Flat & Round
9	O-Ring	Flat & Round
10	Seal, Quad-Ring	Flat & Round

Once assembled, select location, drill 1-3/4” Diameter hole, align plate, using a drill insert the 4 self-piercing sheet metal screws into place to install. Next, align Sensor Pins with slot on the Body of the Duct Mount and turn to seat. See Figure 14.

Figure 14 Duct Mount Mounting



Connecting the Device to the Power Supply and Receiver – 3 Wire

This section describes the installation of the 3 Wire connection (Sourcing and Sinking) from the VDC Power Supply and a 4-20mA Receiver (for example, Scott Controllers or other devices capable of measuring 4-20mA inputs) to the device.

For a the 3 Wire connection (without any options), an operating voltage of 10-30 VDC is necessary from the power supply to correctly power the device.

Warning: *Ensure Receivers and Power Supplies are not powered when installing wire to the device. Failure to do so could result in injury or death.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1 Ensure Receivers and Power Supplies are not powered when installing wire to the device.

2 Route wires of appropriate size from source through conduit runs into the device housing. See Table 63, Field Wiring.

Caution: *RFI may be generated if wires are not appropriately shielded or share conduit with other AC power conductors. Protect wires with appropriate shielding practices to prevent negative equipment performance.*

3 Connect Ground Wire to device's Grounding/Earth Screw on its housing.

To prevent Grounding issues, ensure you have a good Ground/Earth Wire attached to the housing and back to the Receiver's Ground.

4 Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs, to gain access to the lower PCB Stack.

It is not necessary to remove the Wire Ribbon Cable from the upper and lower PCB Stacks.

5 Connect Positive (+) and Negative (-) leads from 10 to 30VDC Power Supply wires to TB1 on the Terminal/Relay/MODBUS RS-485 PCB. Specifically, the Positive (+) connects to Pin2 (+V) and Negative (-) connects to Pin1 (GND) on TB1.

6 Connect Positive (+) and Negative (-) leads from Receivers) to TB2 on the Terminal/Relay/MODBUS RS-485 PCB. See Figure 15, Figure 16 for details.

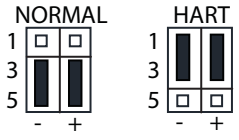
7 Locate SW1 (Isolated/Non-Isolated) on the Power Supply PCB. Place SW1 in the Down position. See Table 24.

Table 24 Sourcing and Sinking Non-Isolated (SW1) Settings

SW1 ISOLATED/NON-ISOLATED	SW1 SETTINGS
☐ SW1 Up= Isloated ■ SW1 Down= Non-Isolated	Down Position

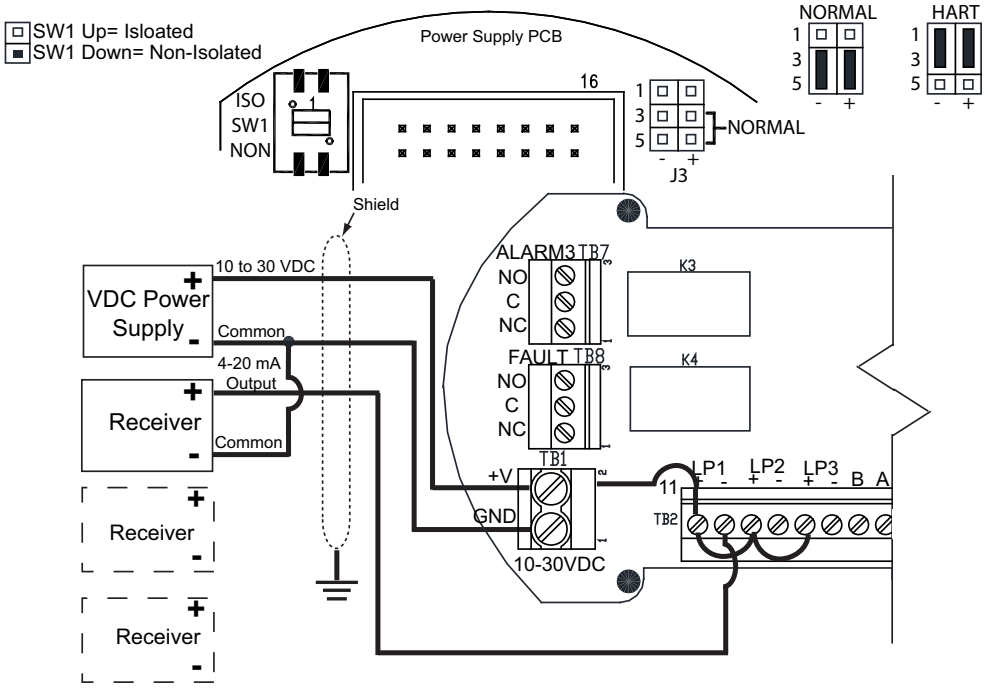
8 Locate J3 (WiredHART) on the Power Supply PCB. Place J3 in the correct position to support your application. See Table 25.

Table 25 WiredHART (J3) Settings

J3 NORMAL/HART	J3 SETTINGS
	For Normal = Position 3&5 for -/+ For Hart = Position 1&3 for -/+

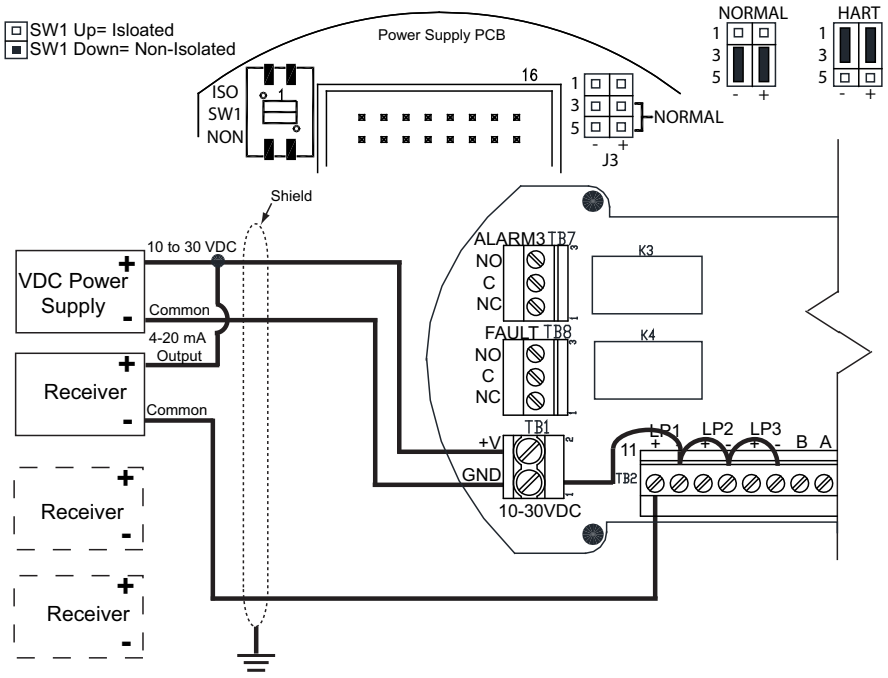
J3 only pertains to the WiredHART PCB.

Figure 15 Connection for 3 Wire Sourcing



These are examples. Other wiring configurations are possible and vary based on each application.

Figure 16 Connection for 3 Wire Sinking



Do not mix Sinking and Sourcing on the same PCB.

9 Insert the lower PCB Stack into the Housing after wiring the terminal blocks.

10 Insert and tighten the four (4) standoffs.

11 Push the LCD PCB/CPU PCB set into the four (4) standoffs.

12 Install Housing Cover, tighten and secure the setscrew.

13 Apply power to Receiver.

Connecting the Device to the Power Supply – 2 Wire

This section describes the installation of the 2 Wire connection from the VDC Power Supply and a 4-20mA Receiver (for example, Scott Controllers or other devices capable of measuring 4-20mA inputs) to the device.

For a the 2 Wire connection (without any options), an operating voltage of 18-30 VDC is necessary from the power supply to correctly power the device.

Warning: *Ensure Receivers and Power Supplies are not powered when installing wire to the device. Failure to do so could result in injury or death.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1. Ensure Receivers and Power Supplies are not powered when installing wire to the device.
2. Route wires of appropriate size from source through conduit runs into the device housing. See Table 63, Field Wiring.

Caution: *RFI may be generated if wires are not appropriately shielded or share conduit with other AC power conductors. Protect wires with appropriate shielding practices to prevent negative equipment performance.*

3. Connect Ground Wire to device's Grounding/Earth Screw on its housing.

To prevent Grounding issues, ensure you have a good Ground/Earth Wire attached to the housing and back to the Receiver's Ground.

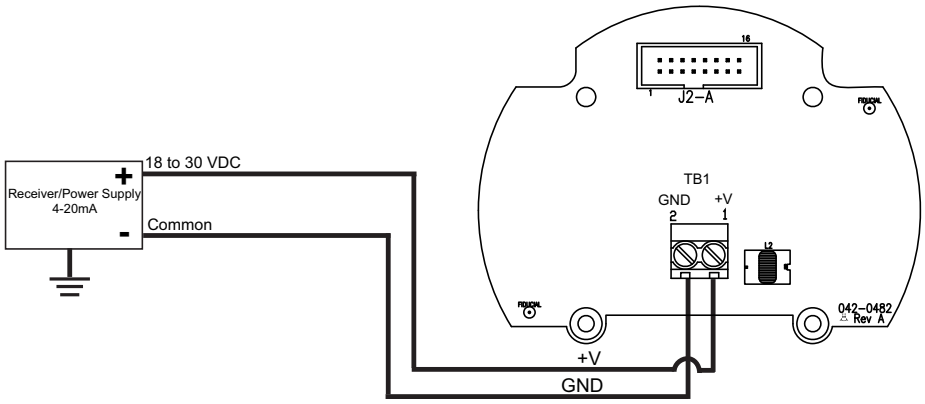
4. Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs, to gain access to the lower PCB Stack.

It is not necessary to remove the Wire Ribbon Cable from the upper and lower PCB Stacks.

5. Connect Positive (+) and Negative (-) leads from VDC Power Supply wires to TB1 on the 2 Wire Power Supply PCB. Specifically, the Positive (+) connects to Pin1 (+V) and Negative (-) connects to Pin2 (GND) on TB1. See Figure 17.

The VDC Power Supply requirements are different when using the 2 Wire PCB. See "Device Specifications" on page 130.

Figure 17 Connection for 2 Wire



6 Insert the lower PCB Stack into the Housing after wiring the terminal blocks.

7 Insert and tighten the four (4) standoffs.

8 Push the LCD PCB/CPU PCB set into the four (4) standoffs.

9 Install Housing Cover, tighten and secure the setscrew.

10 Apply power to Receiver.

Connecting the Device to the Power Supply and Receiver – 4 Wire

This section describes the installation of the 4 Wire connection (Sourcing and Sinking) from the VDC Power Supply and a 4-20mA Receiver (for example, Scott Controllers or other devices capable of measuring 4-20mA inputs) to the device with Isolated Loop Power.

Warning: *Ensure there is no power coming from the Receiver when installing wire to the device. Failure to do so could result in injury or death.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1 Ensure Receivers and Power Supplies are not powered when installing wire to the device.

2 Route wires of appropriate size from source through conduit runs into the device housing. See Table 63, Field Wiring.

Caution: *RFI may be generated if wires are not appropriately shielded or share conduit with other AC power conductors. Protect wires with appropriate shielding practices to prevent negative equipment performance.*

3 Connect Ground Wire to device's Grounding/Earth Screw on its housing.

To prevent Grounding issues, ensure you have a good Ground/Earth Wire attached to the housing and back to the Receiver's Ground.

4 Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs, to gain access to the lower PCB Stack.

It is not necessary to remove the Wire Ribbon Cable from the upper and lower PCB Stacks.

5 Connect Positive (+) and Negative (-) leads from 10 to 30VDC Power Supply wires to TB1 on the Isolated 4-20mA PCB. Specifically, the Positive (+) connects to Pin2 (+V) and Negative (-) connects to Pin1 (GND) on TB1.

6 Connect Positive (+) and Negative (-) leads from Receivers) to TB2 on the Terminal/Relay/MODBUS RS-485 PCB. See Figure 18, Figure 19 for details.

7 Locate SW1 (Isolated/Non-Isolated) on the Power Supply PCB. Place SW1 in the Up position. See Table 26.

Table 26 Sourcing and Sinking Isolated (SW1) Settings

SW1 ISOLATED/NON-ISOLATED	SW1 SETTINGS
SW1 Up= Isloated SW1 Down= Non-Isolated	Up Position

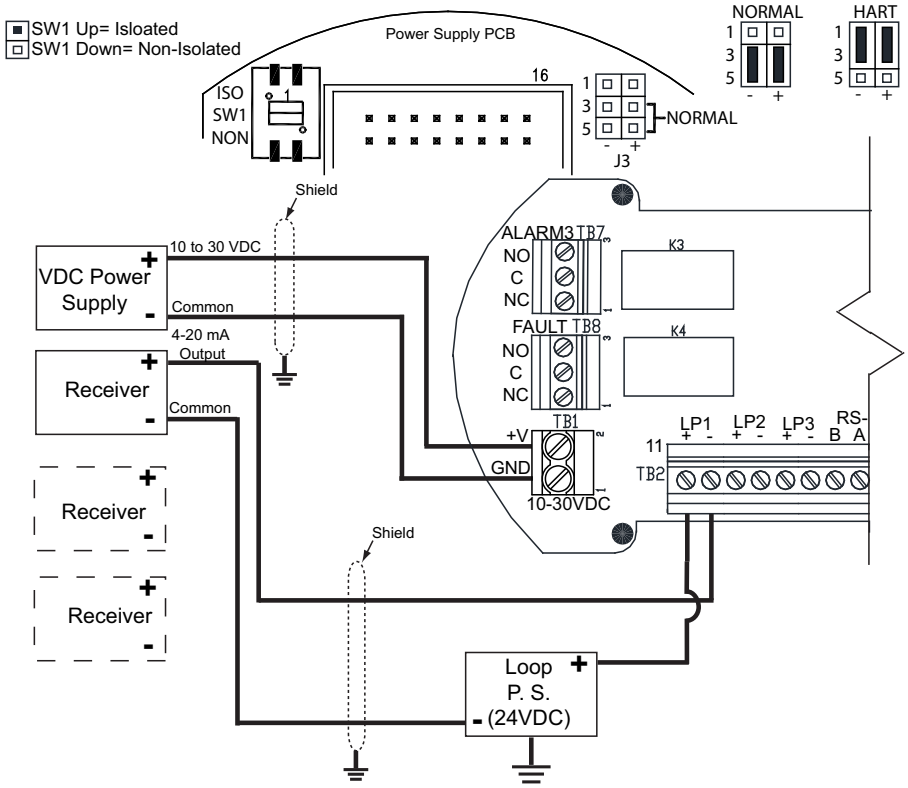
8 Locate SW2 (WiredHART Source/Sink) on the Power Supply PCB. Place SW2 in the correct position to support your application. See Table 27.

SW2 only pertains to the WiredHART PCB.

Table 27 WiredHART (J3) Settings

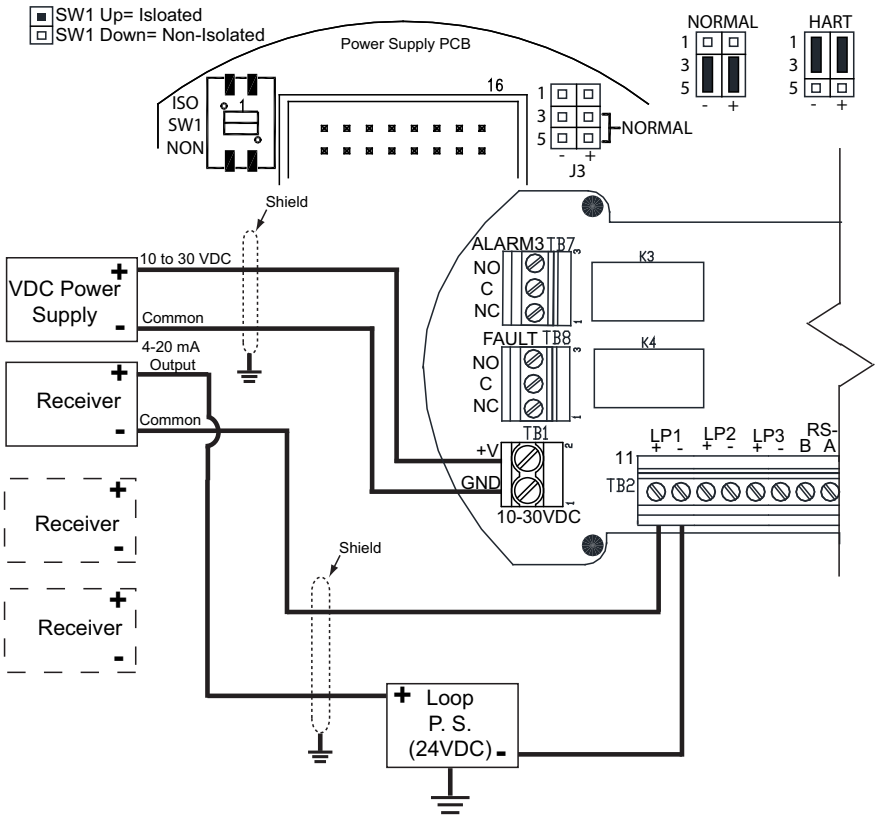
J3 NORMAL/HART	J3 SETTINGS
NORMAL 1 3 5 - + HART 1 3 5 - +	For Normal = Position 3&5 for -/+ For Hart = Position 1&3 for -/+

Figure 18 Connection for 4 Wire Sourcing with Isolated Loop Power Supply



These are examples. Other wiring configurations are possible and vary based on each application.

Figure 19 Connection for 4 Wire Sinking with Isolated Loop Power Supply



Do not mix Sinking and Sourcing on the same PCB.

9 Insert the lower PCB Stack into the Housing after wiring the terminal blocks.

10 Insert and tighten the four (4) standoffs.

11 Push the LCD PCB/CPU PCB set into the four (4) standoffs.

12 Install Housing Cover, tighten and secure the setscrew.

13 Apply power to Receiver.

Connecting from the Device to Scott Receivers

This section provides connections from the device to various Scott Receivers (Controllers). Use MODBUS 12bit resolution to ensure compatibility with Scott Receivers. Refer to following applicable sections based on your application. See "Connecting the Device to the Power Supply and Receiver – 3 Wire" on page 36. See "Connecting the Device to the Power Supply – 2 Wire" on page 39. See "Connecting the Device to the Power Supply and Receiver – 4 Wire" on page 40.

Caution: *Ensure you remap the MODBUS Registers when retrofitting the device with an existing Scott Controller that supports MODBUS Registers.*

Connecting Relays & Remote Alarm Reset

This section describes how to connect the Relays and the Remote Alarm Reset. Using this feature is optional.

The Terminal/Relay/MODBUS RS-485 PCB contains four (4) relays (K1, K2, K3 and K4) and a Remote Reset.

Ensure you have already made the proper connections prior to connecting the Terminal/Relay/MODBUS RS-485 PCB. See "Connecting the Device to the Power Supply and Receiver – 3 Wire" on page 36. *See* "Connecting from the Device to Scott Receivers" on page 44.

Warning: *Ensure Receivers and Power Supplies are not powered when installing wire to the device. Failure to do so could result in injury or death.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1. Ensure Receivers and Power Supplies are not powered when installing wire to the device.
2. Route wires of appropriate size from source through conduit runs into the device housing. See Table 63, Field Wiring.
3. Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs, to gain access to the lower PCB Stack.

It is not necessary to remove the Wire Ribbon Cable from the upper and lower PCB Stacks.

4. If desired, connect wiring from Receiver equipment to one or more of the four (4) Relays on the Terminal/Relay/MODBUS RS-485 PCB. Relays are designated ALARM1 (TB5, K1 for Relay1), ALARM2 (TB6, K2 for Relay2), ALARM3 (TB7, K3 for Relay3) and FAULT (TB8, K4 for Relay4). Each relay has three (3) Pins for wiring; a Normally Open (NO), a Normally Closed (NC), and a Common (C). See Figure 20 and Figure 21.

Figure 20 Relay/Alarm Connection Example -Terminal/Relay/MODBUS PCB

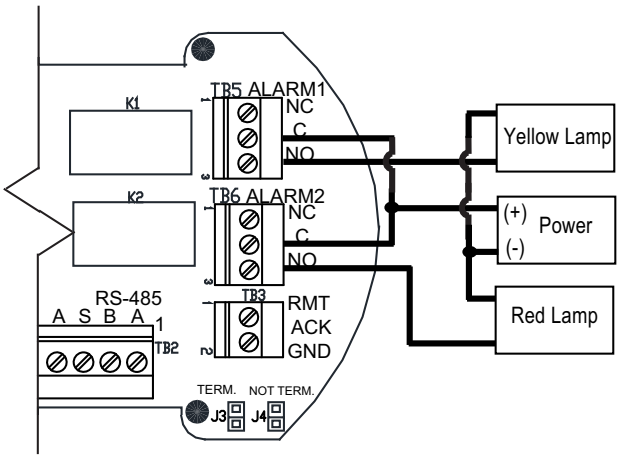
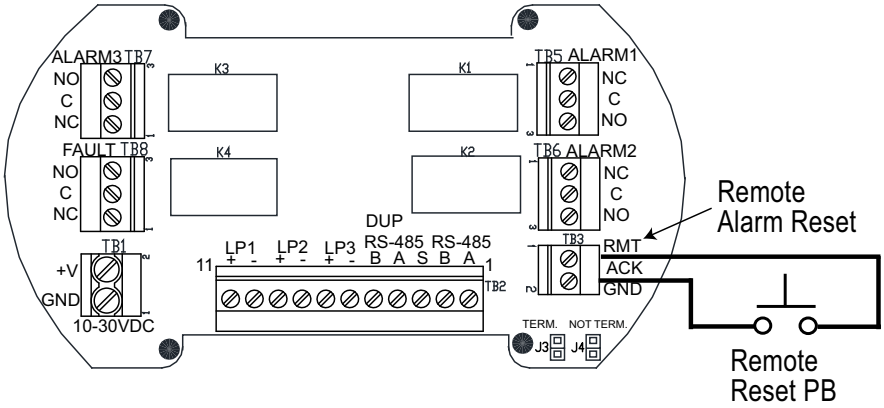


Figure 21 Relays/Remote Alarm Reset Connections -Terminal/Relay/MODBUS PCB



Caution: *Contacts are rated for resistive loads; alarm relays have dry contacts (form C) and power must be supplied from an external source. Failure to do so could result in failure of alarm relays.*

5 If desired, connect a Remote Switch to TB3 on the Terminal/Relay/MODBUS RS-485 PCB. This feature allows you to shut off and reset a sounding Remote Alarm. See Figure 21.

Warning: *External wiring to TB3 must be shielded and protected from noise spikes to prevent a false alarm reset condition. Failure to do so could result in injury or death if a false alarm reset condition occurs.*

6 Insert the lower PCB Stack into the Housing after wiring the terminal blocks.

7 Insert and tighten the four (4) standoffs.

8 Push the LCD PCB/CPU PCB set into the four (4) standoffs.

9 Install Housing Cover, tighten and secure the setscrew.

Connecting MODBUS RS-485

This section describes how to connect MODBUS RS-485 to multiple devices to use the MODBUS RS-485 Communication Protocol. Using this feature is optional.

MODBUS RS-485 connection allows a MODBUS Network connection that is used to connect several devices to a single Receiver for monitoring purposes. It supports up to 247 addressed RTUs. Up to 32 RTUs per loop. Each connected device becomes a Remote Terminal Unit (RTU) and requires a unique RTU address.

Consult receiver equipment instructions for information on wiring in addition to what is provided in this manual as various equipment may have additional specific requirements.

***Warning:** Ensure Receivers and Power Supplies are not powered when installing wire to the device. Failure to do so could result in injury or death.*

***Warning:** Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1. Ensure Receivers and Power Supplies are not powered when installing wire to the device.
2. Determine if other devices (RTUs) are to be wired or if the current device (RTU) is the last device being wired on the MODBUS Network.
3. Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs, to gain access to the lower PCB Stack.

It is not necessary to remove the Wire Ribbon Cable from the upper and lower PCB Stacks.

4. Set or verify J3 or J4 on the Terminal/Relay/MODBUS RS-485 PCB as follows:
   a. For a device at the end of the network with no other RTUs to be wired, install the Terminating Resistor into J3.
   b. For device with other RTUs to be wired from the current device, install the Terminating Resistor into J4. See Table 28.

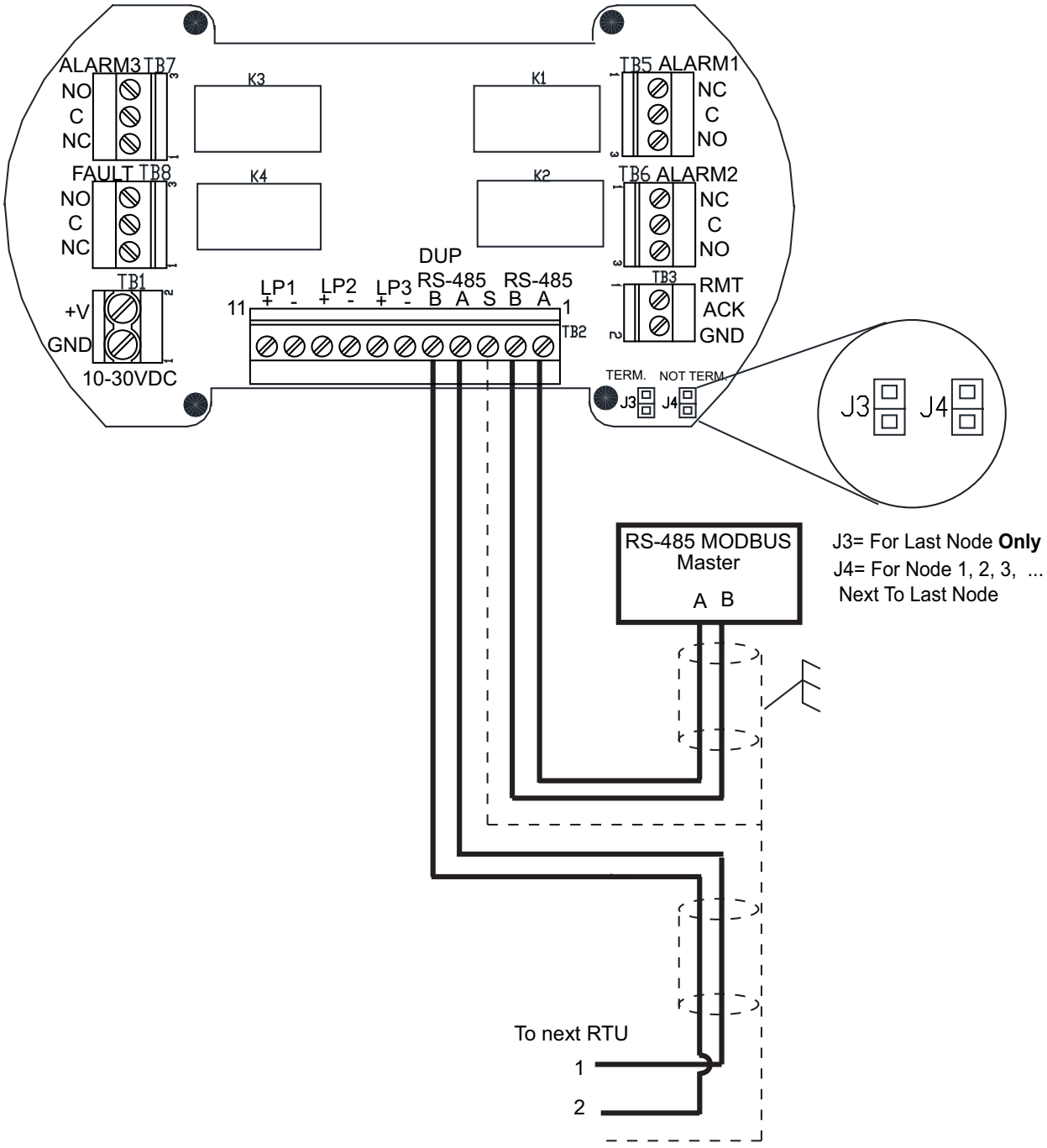
Table 28 Jumper (J1) Settings for the Device

DEVICE'S POSITION ON THE MODBUS NETWORK	JUMPER SETTING
Device is the last RTU	J3 (Termination)
Device is NOT the last RTU	J4 (Not Terminated)

5. Connect your MODBUS Master input wire signals at TB2 Pin1 (A) and TB2 Pin2 (B) on the Terminal/Relay/MODBUS RS-485 PCB.
6. Cable shielding must connect to TB2 Pin3 (S).
7. Route Output Wiring to next RTU from TB2 Pin4 (A) and TB2 Pin5 (B). See Figure 22.
8. For MODBUS connections to Scott Controllers, See "Connecting from the Device to Scott Receivers" on page 44.

TB2 Pin1 and Pin4 are connected internally as are TB2 Pins2 and Pin5.

Figure 22 MODBUS Connections - Terminal/Relay/MODBUS RS-485 PCB



9 Insert the lower PCB Stack into the Housing after wiring the terminal blocks.

10 Insert and tighten the four (4) standoffs.

11 Push the LCD PCB/CPU PCB set into the four (4) standoffs.

12 Install Housing Cover, tighten and secure the setscrew.

13 When powered up, assign unique RTU address to each of the devices on the MODBUS Network using the MODBUS Setup menu. See "Configuring the Setup Menu" on page 62.

Installing the Optional Communication Expansion Card (CEC) PCB

This section describes how to install an Optional Communication Expansion Card (CEC) PCB when required.

The Optional Communication Expansion (CEC) PCB is automatically configured on installation.

***Warning:** Ensure Receivers and Power Supplies are not powered when installing PCB into the device. Failure to do so could result in injury or death.*

***Warning:** Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

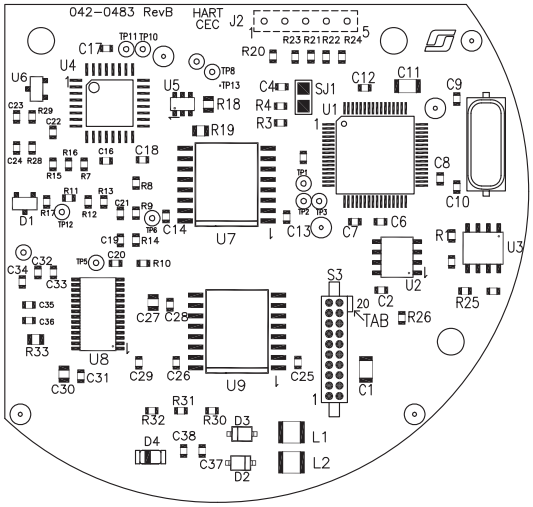
1 Ensure Receivers and Power Supplies are not powered when installing wire to the device.

2 Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.

3 Connect the Optional Communication Expansion Card (CEC) PCB's female 20-pin connector (S3) into the male 20-pin connector (P3) on the CPU PCB. See Figure 23.

4 Secure the Optional Communication Expansion Card (CEC) PCB using the three (3) screws.

Figure 23 Optional Communication Expansion Card (CEC) PCB Connection



Ensure all related Switches and Jumpers are properly set on other applicable PCB.

5 Push the LCD PCB/CPU PCB and Optional Communication Expansion Card (CEC) PCB set into the four (4) standoffs.

6 Install Housing Cover, tighten and secure the setscrew.

7 Apply power to Receiver.

Connecting the Sensor Head

This section describes how to connect Sensor Head's 6-Pin Plug Connector onto the Intrinsically Safe Barrier PCB of the device.

Warning: *Ensure Receivers and Power Supplies are not powered when installing wire to the device. Failure to do so could result in injury or death.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1 Ensure Receivers and Power Supplies are not powered when installing wire to the device.

2 Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs, to gain access to the lower PCB Stack.

It is not necessary to remove the Wire Ribbon Cable from the upper and lower PCB Stacks.

3 Loosen and remove the four (4) standoffs.

4 Remove the entire PCB Stack for easy wiring to terminal blocks.

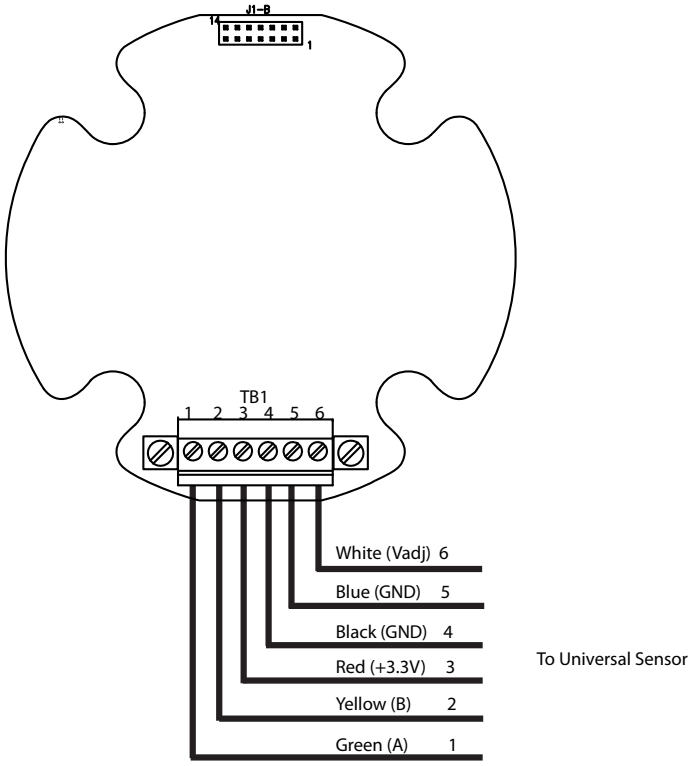
5 Remove the two (2) Phillip Head screws to the Terminal Block Cover to access the 6-Pin Plug Connector (TB1).

6 Insert the 6-wires from the Meridian Detector Body Assembly through the bottom of the threaded hole of the device.

7 Insert the 6-wires into the 6-Pin Plug Connector(TB1) 1, 2, 3, 4, 5 and 6 respectively, Green (A), Yellow (B), Red (3.3V), Black (GND), Blue (GND), and White (V_{adj}). See Figure 24.

Light blue terminal blocks indicate Intrinsically Safe circuits. Tighten plug retention screws.

Figure 24 Meridian Detector Body Assembly Connection



8 Replace the Terminal Block Cover using the two (2) Phillip Head screws.

9 Insert the entire PCB Stack into the Housing after wiring the terminal blocks.

10 Insert and tighten the four (4) standoffs.

11 Push the LCD PCB/CPU PCB set into the four (4) standoffs.

12 Install Housing Cover, tighten and secure the setscrew.

Installing/Replacing a Sensor

This section describes how to initially install/replace a Sensor.

The Sensor does not ship installed in to the device. Additionally, it should be replaced as the need arises.

Sensors originally ordered with the device are pre-configured and only require calibration.

Warning: *To avoid the possible need of re-calibrating a calibrated sensor, verify that the device date and time and correct prior to accepting sensors).*

Warning: *The device is not actively monitoring target gases when power is removed. Verify atmosphere is safe or monitor atmosphere with another device while installing a new sensor to prevent risk of injury or death.*

Removing power is not required when installing/replacing the Sensor. Follow local procedures and safety regulations.

Warning: *Alarm Settings are stored in the sensor. Changing sensor changes Alarm Settings. Verify prior to proceeding.*

Removing Sensors) creates a Fault condition (FLT LED blinks, error message alternates between System Fault and Sensor Offline on the LCD). To avoid this fault condition, using the Menu, enter password, take sensors) offline and save the change, then remove the sensors). The device places the sensors) back online and begins its warm-up time.

1. Ensure the device has power.
2. Using the Menu, set Offline Sensor to the number of Sensors to be connected to the Device (1, 2 or 3) to Yes.
3. Set Sensors Enable to the number of Sensors to be connected to the Device (1, 2 or 3).
4. Loosen and remove the Meridian End Cap.

Some E-Chem Sensors ship equipped with an E-Chem Sensor Bias Assembly. This keeps the E-Chem Sensor warm to reduce warm up time at installation. It is not reusable.

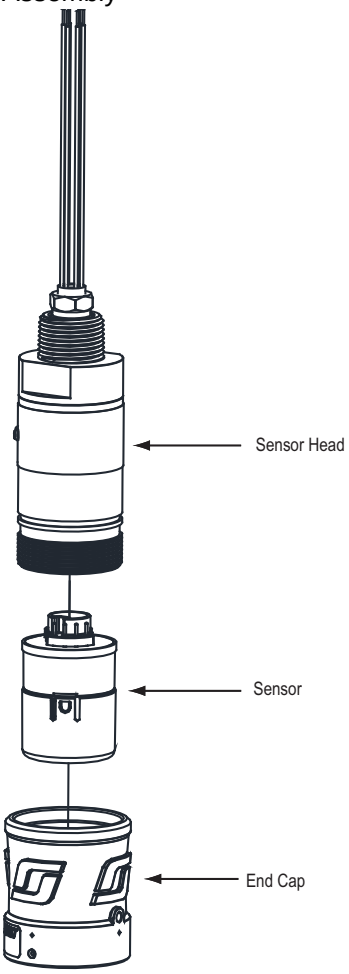
5. Remove the E-Chem Sensor Bias Module from the E-Chem Sensor, if applicable.

Warning: *To prevent risk of injury or death, do not take the E-Chem Sensor Bias Module into a potentially explosive atmosphere.*

Warning: *The order that the sensors) are installed is important. The first sensor physically inserted becomes Sensor1 in the system, the second physically inserted becomes Sensor2 and the third physically inserted becomes Sensor3. You must conform to the sensor type rules per sensor position in the system configuration as outlined in* Table 17*. When sensor configuration rules are violated or are attempted, the device automatically goes into an immediate fault mode. This is an illegal Configuration (Not Intrinsically Safe). Failure to adhere to the correct sensor mapping could result in injury or death.*

6. Insert Sensor1 into the Sensor Head, twist until it snaps into place and acknowledge via LCD. It self aligns in the Sensor Head. See Figure 25.

Figure 25 Meridian Detector Body Assembly



7 The Gas Type, Sensor #1, displays on the LCD. Repeat for others Sensors.

When a different Sensor is detected, the LCD displays the option to Reject or Accept. If the selection is an Intrinsically Safe violation, All LEDs flash and the LCD displays I.S. VIOLATION. CORRECT, HIT ENTER KEY TO REBOOT. Remove the violating sensor prior to rebooting.

8 Replace the Meridian End Cap and secure the setscrew.

Caution: *Meridian End Cap must be attached to protect the device from ingress from water or dust. Ensure all sensors) are installed prior to operation.Ensure Meridian End Cap is installed prior to operation. Only use Meridian End Cap P/N 096-3437-1 or 096-3437-2.*

9 Allow a few minutes for the Sensor to warm up. The warm up time depends on the Sensor type. During warm-up the loop current is setup to inhibit automatically.

To remove Sensor, remove Meridian End Cap and then just pull it straight down. See Figure 25.

Do not attempt to service Sensors in the field. If service is needed, contact the factory. See “Technical Service” on page 158.

Chapter 4

CONFIGURATION AND SETUP

Chapter Overview

This chapter covers the following topics:

- Configuring the Device
- Device Configuration Examples
- Configuration Defaults
- Using the MODBUS Registers
- Using the TXCommands

Configuring the Device

This section covers the various configuration parameters for the device.

Warning: *Configuration should be performed by trained individuals who have read this manual and understand the calibration procedures. Failure to follow these instructions may result in serious injury or death.*

Warning: *When the primary device is off line, ensure you have another online device to actively detect gases. The device may be off line due to such activities, like but not limited to, calibration, installation, maintenance, troubleshooting, configuration, wiring and other activities.*

Warning: *When settings are changed, ensure those changes are communicated to all affected personnel.*

Warning: *Before you begin, read and understand the MSDS and warning labels for the calibration gases. Failure to do so may result in serious injury or death.*

All device configuration variables are selected via the menu screens and those variables are stored in its Non-Volatile Memory (NV-EEPROM). Many menu items contain default values from the factory and require changes to better match your applicable application.

A device may be configured using the supplied magnet and the four (4) navigation keys in approximately 5-10 minutes. To enter the Configuration Menu, press the ENT key. See "Operating the Device" on page 102.

Figure 26 and Figure 27 outlines the entire configuration menu structure. The configuration menu structure of a device is divided into six (6) menu trees. They are: Information (see Figure 28), Setup (see Figure 29), Calibration (see Figure 30), Datalog (see Figure 31), Display (see Figure 32) and User Access (see Figure 33).

The menu screens in this chapter are based on the device's Firmware. Version 1.12. If your device has a different firmware version, then the menu screens will vary somewhat.

User Access Levels

This section covers the user access levels.

These are the levels and their associated privileges.

- No User Access:
  - Allows viewing of transmitter information
- Operator Access – OA (factory default is 0000):
  - Allows viewing of transmitter information
  - Allows Zeroing and Spanning the sensors
- System Manager Access – SMA (factory default is 0000):
  - Allows viewing of transmitter information
  - Allows Zeroing and Spanning the sensors

– Allows Changing system parameters

User Access level determines the display of some parameters.

Access to certain value entry menus and individual parameters are restricted and denoted by RO (Read Only) located in the top left hand corner of the menu screens. They require a user access. Refer to Figure 26, Figure 27, and Table 30 to Table 37

Figure 26 Configuration Menu Structure - (1 of 2)

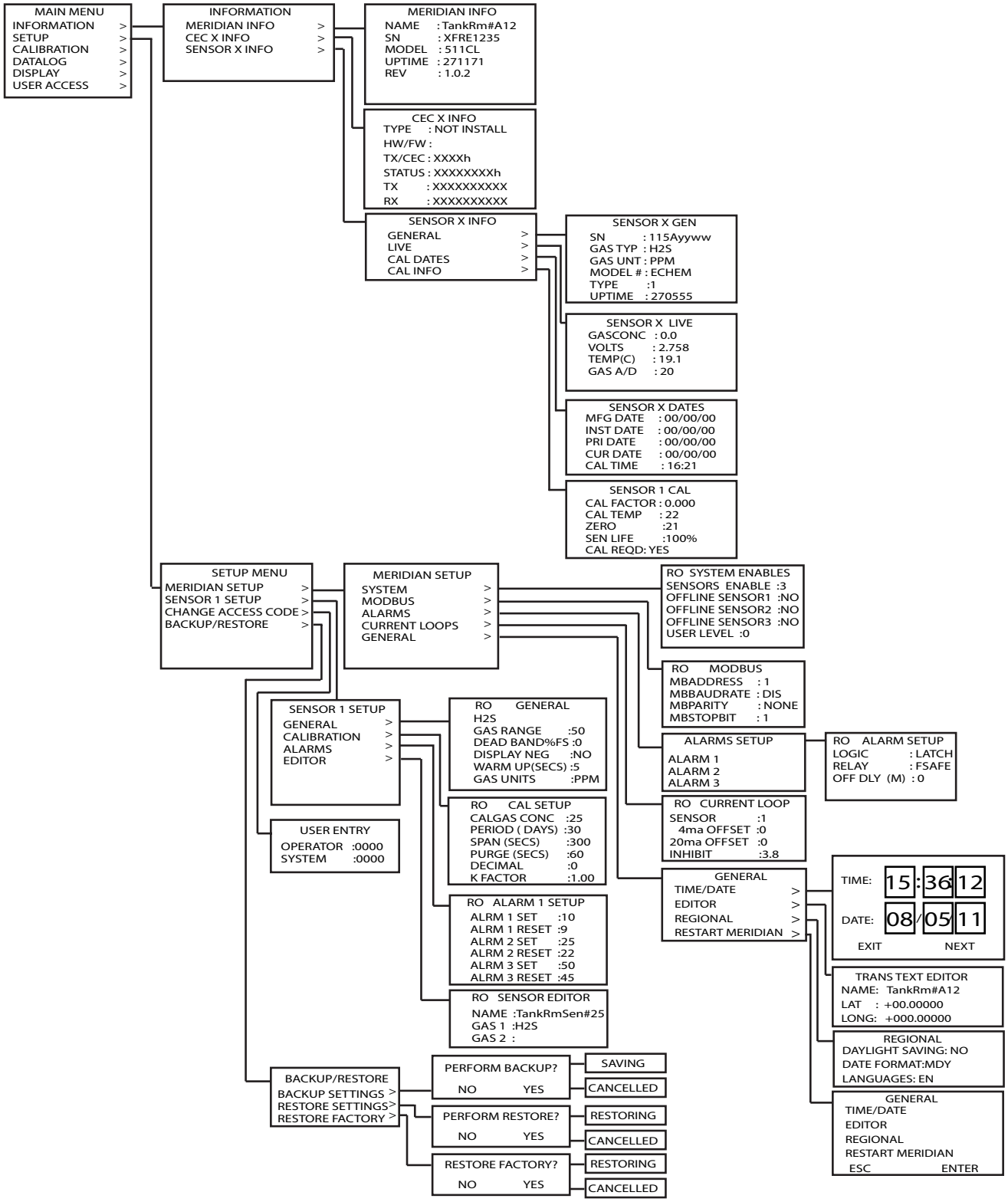
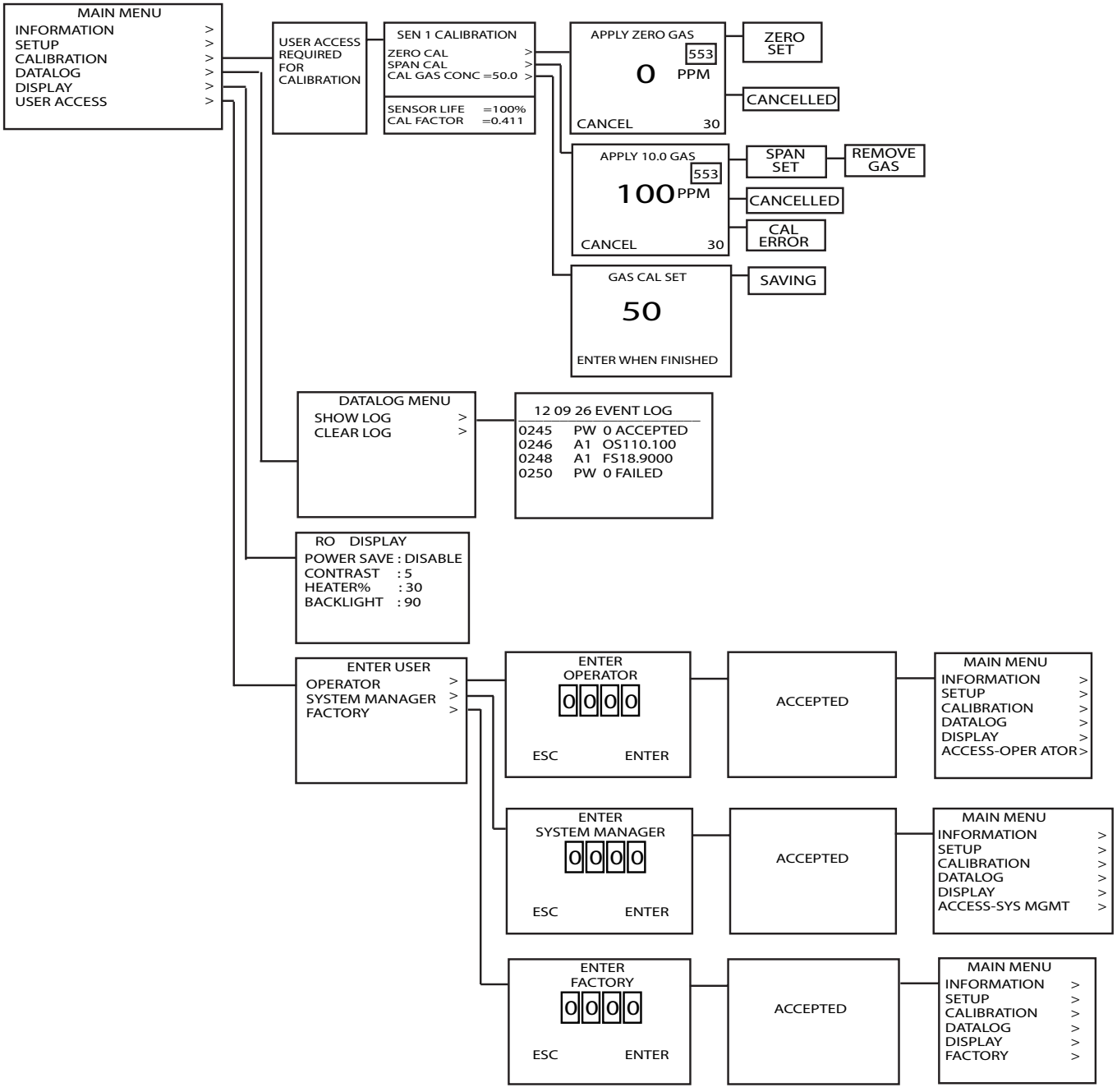


Figure 27 Configuration Menu Structure - (2 of 2)



Using the Information Menu

This section covers the Information Menu.

Use the magnetic keys to navigate through the menu structure as necessary. See Figure 28. The parameters are detailed in Table 29.

Figure 28 Information Menu Structure

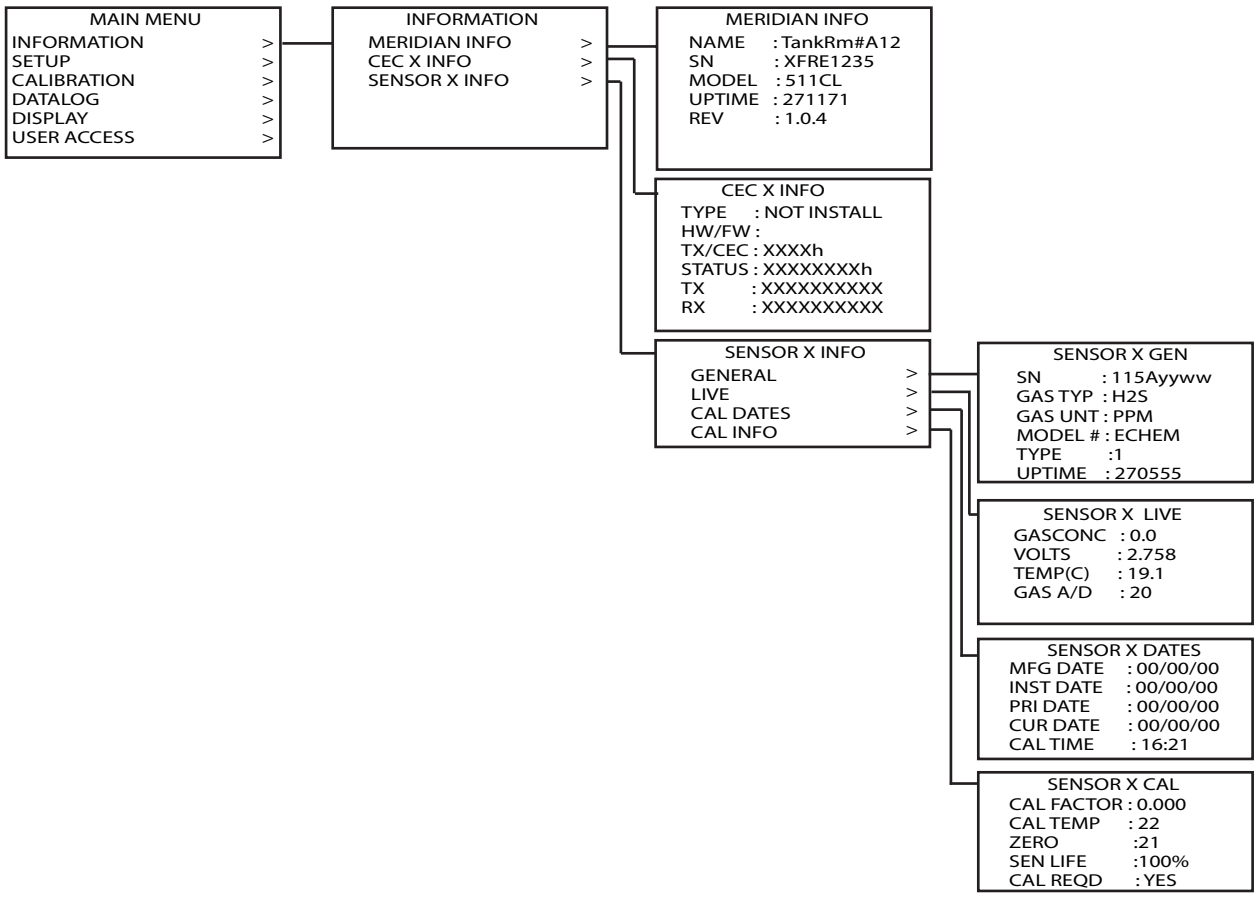


Table 29 Information Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION*
Tx Information	Name	Displays the monitored point by your tag # or other familiar terminology.
	SN	Displays the Serial Number.
	Model	Displays the Model Number.
	Uptime	Displays the power on time in Seconds for up to 4 billion.
	Revision	Displays the Revision of the Firmware.

Table 29 Information Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION*
CEC X Info (Communication Extension Card) Information	Type	The CEC_Type If Optional Communication PCB (CEC) is not installed in device, then Type displays “Not Installed”.
	HW/FW	The CEC HW/FW This is a combined CEC hardware and firmware bytes.
	TX/CEC	This is a bit defined status of the TX/CEC interface based on this table. This table is defined in the TX MB register named CECStatus (40142). CECStatus Lower byte:CEC1Status Upper byte:Reserved If 0=No CEC detected bit: 0=CEC EEPROM detected 1=CEC uP comms up 2=CEC requested DataBase 3=DB download complete 4=DB mismatch 5=DB CRC error 6=Protocol error 7=Undefined error

Table 29 Information Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION*
CEC X Info (Communication Extension Card) Information (Continued)	Status	This is the 4byte status returned by the CEC. Device Status (byte): bit0=Busy bit1=Hardware Error bit2=NVMEMORY at defaults bit3=Spare bit4=Spare bit5=Spare bit6=Lock Status bit7=Initialize Complete Network Status (byte): bit0=Ready to Communicate bit1=Spare bit2=Spare bit3=Spare bit4=Spare bit5-Spare bit6=Connection Status (States & Status below) bit7=Connection Status (States & Status below) States & Status of bits6 & 7: bit6&7state=0,0 Status=Reserved bit6&7state=1,0 Status=Discovery:Field device is looking for other neighbors. bit6&7state=0,1 Status=Joining: Field device is in the join process (typically 30S to 5Min) bit6&7state=1,1 Status=Operational: Field device has established communications. Device Information (High byte): Bits are undefined, thus always 00. Device Information (Low byte): Bits are undefined, thus always 00.
	TX	This is a counter that the transmitter increments to count the bytes sent to the CEC. It is the interface between the transmitter and the CEC.
	RX	This is a counter that the transmitter increments to count the bytes received by the CEC. It is the interface between the transmitter and the CEC.

Table 29 Information Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION*
Sensor X General	SN	Displays the Serial Number.
	GasType	Displays the Gas Type.
	Gas Units	Displays Gas Units. %, %LEL, PPB, or PPM.
	Model#	Displays the Model Number.
	Type	Displays the Sensor's technology type: 1=E-Chem 2=IR 3=Cat Bead 4=MOS
	Uptime	Displays the power on time in Seconds for up to 4 billion. Counter resets after Sensor is removed.
Sensor X Live	GasConc	Displays gas concentration from the sensor. Displays with or without decimal points as appropriate.
	Volts	Displays the Sensor Voltage.
	Temp(C)	Displays the Sensor Temperature in °C.
	Gas A/D	Displays the A/D output, the raw count.
Sensor X Cal Dates	Mfg Date	Displays manufactured date. Read from the Sensor.
	Install Date	Displays installation date. Read from the Sensor.
	Prior Date	Displays prior calibration date.
	Current Date	Displays the most recent calibration date.
	Cal Time	Displays the last Cal Time.
Sensor X Cal Info	Cal Factor	Displays the resolution of the Sensor.
	Cal Temp	Displays the temperature (°C) of Sensor when calibrated.
	Zero	Displays A/D reading when zeroed.
	Sen Life	Display the sensor current life as %.
	Cal Required	Displays Yes or No.
* No user access required to access these particular parameters.		

Configuring the Setup Menu

This section covers the Setup Menu.

Use the magnetic keys to navigate through the menu structure as necessary. See Figure 29. The parameters are detailed in Table 30, Table 31, Table 32 and Table 33.

Figure 29 Setup Menu Structure

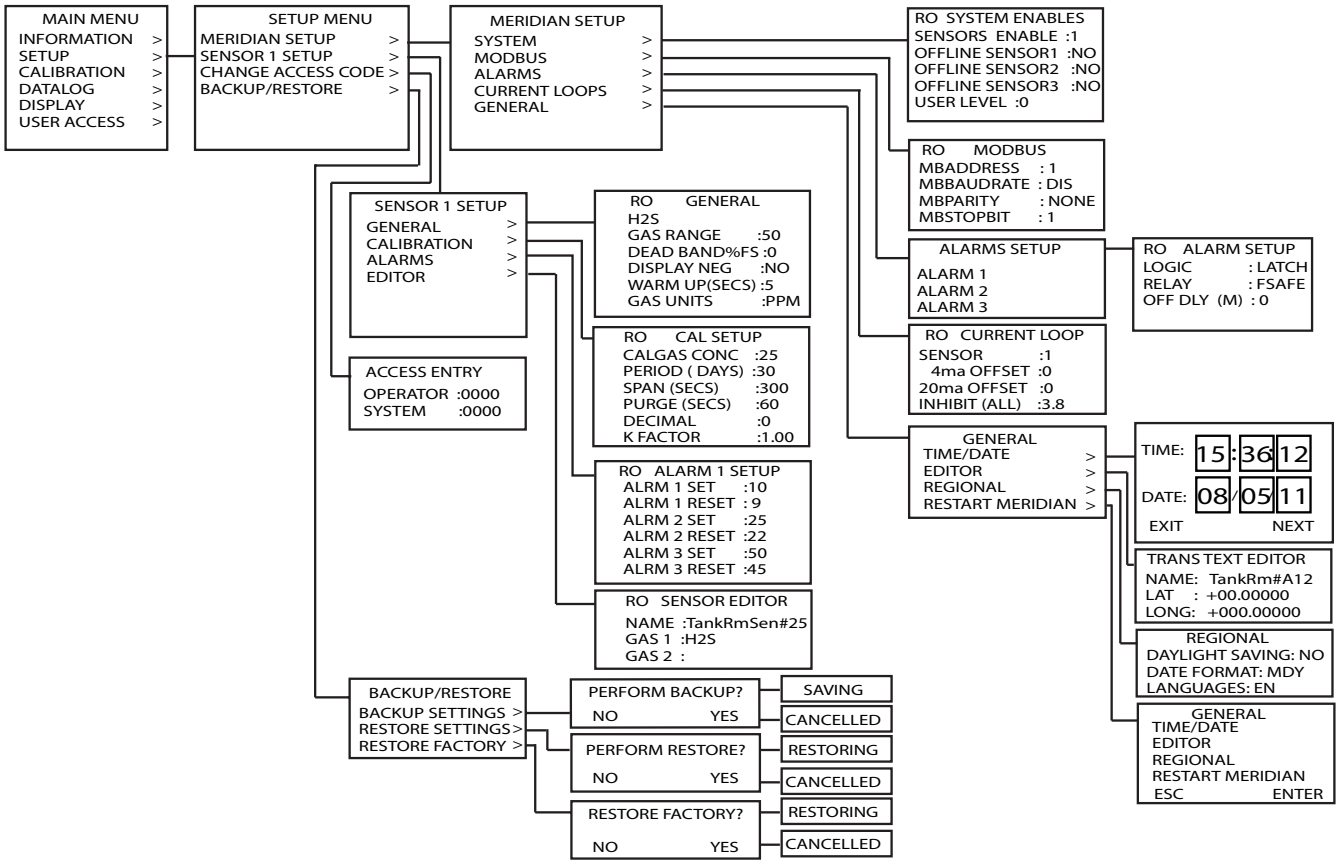


Table 30 Transmitter Setup Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION	OA	SMA
System	Sensors Enable	Enables 1, 2 or 3 sensors within the system.	†	
	Offline SensorX	No – Allows that specific Sensor to remain online. Yes – Takes that specific Sensor Offline. Offline may be used to prevent an alarm when removing a sensor.	†	
	User Level	Sets the device's Minimum/Default Access Level. This setting is used during power up, after power failures and after 5 minutes while using a higher user access level. Select from: 0, No Access = Allows viewing of transmitter information. 1, Operator Access (OA) = Allows viewing of transmitter information, Zeroing and Spanning the Sensors. 2, System Manager Access (SMA) = Allows viewing of transmitter information, Zeroing and Spanning the Sensors, and Changing system parameters. See Table 37.		
Modbus	MBAddress	Used to map RTUs. Each device is assigned its own RTU address. Address range is 1 to 247. Up to 32 RTUs per loop are supported. Note: Each device must have its own RTU Address while communicating on the same two (2) wire cable to prevent bus conflicts with Receiving Equipment. Default= 0		†
	MBBaudRate	Used to communicate with RTUs. Select from: 9600, 19200, DISABLED		†
	MBParity	Used to communicate with RTUs. Select from: Even, Odd, None		†
	MBStopBit	Used to communicate with RTUs. Select from: 0, 1, 2		†

Table 30 Transmitter Setup Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION	OA	SMA
Alarms	Logic	Latch – Causes the alarm to remain active even after the condition is gone and only reset when acknowledged via one of these three (3) methods: MODBUS, user input via the four (4) Keys, or Remote Acknowledge Reset Button. No Latch – The alarm is active only while the condition exists. The alarm clears after the condition passes.		†
	Relay	Non-Failsafe – The relay energizes during alarm and de-energizes with no alarm. Failsafe – The relay de-energizes during alarm and energizes with no alarm. This is useful for signaling alarm when device power is lost. K4 is a FAULT alarm and is always failsafe. For example, in normal mode, power is on, and the alarm is off. In fail mode, power is off, and alarm is on.		†
	Off Delay(M)	Allows entering a delay before clearing an alarm after the alarm condition is gone. This is useful for continuing an alarm function, such as operation of an exhaust fan, for a period of time after the alarm condition clears. Range 0 to 120.		†
Current Loops	Sensor X	Selects the Sensor. Range 1 to 3	†	
	4mA Offset	Allows adjustments to the Current Loop counts of the Sensor. Range 0 to 127; 0 to -128. Note: If necessary, See “Trimming the 4-20mA Loop” on page 119.		†
	20mA Offset	Allows adjustments to the Current Loop counts of the Sensor. Range 0 to 127; 0 to -128. Note: If necessary, See “Trimming the 4-20mA Loop” on page 119.		†
	Inhibit (ALL)	Takes the 4-20mA signal and adjusts it during Inhibit for either individual Sensor or the entire device. Default= 3.8mA Range 3.8 to 24mA in .1mA steps		†

Table 30 Transmitter Setup Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION	OA	SMA
General	Time/Date	Allows editing the Time and Date settings. Time in Military format and date is mm/dd/yy format.	N/A	
	Editor	Name – An editable 16 ASCII charter text String. Typically used to identify the monitored point by your tag # or other familiar terminology. Lat – Allows entry of degrees and fraction of degrees. Long – Allows entry of degrees and fraction of degrees.		†
	Regional	Daylight Savings – Select Yes or No. Date Format – Select MDY, DMY or YMD. Languages – Select from list provided.	†	
	Restart Meridian	Allows the reboot of the device. Select Esc or Enter.		†
† Indicates the minimum User Access Level required to access this particular parameter.				

Table 31 Sensor X Setup Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION	OA	SMA
General	Gas Type	Displays Gas Type based on the installed Sensor. Note: Only IR-Combustible sensors may be changed. Selection is limited per sensor.The Combustible IR Sensor (096-3473-56) allows the selection of diffeternt target gases. See “Selecting the Combustible IR Sensor’s Target Gas” on page 116.		**
	GasRange	Current gas range. Displays on LCD. Also used to change the sensor’s gas range for applicable sensor. Range varies based on installed Sensor. Note: Changing a sensors Gas range automatically changes its associated Set and Reset values. Therefore, ensure you verify these settings after changing its Gas Range. See “Changing the E-Chem Sensor’s Range” on page 116.		†
	DeadBand %FS	Allows forcing low values to continue to read zero. This is useful when there are small amounts of background gases that cause fluctuating readouts above zero. The highest amount of deadband allowed is 5%. 0% FS= 0mA output. Range 0 to 5.		†
	DisplayNegative	Yes – Select to display negative gas monitor values. No – Select not to display negative monitor values. Causes negative values to read the (0%) value in data displays.		†
	WarmUp (SECS, MIN, HRS)	Time delay set to prevent unwanted alarm trips while Sensor is warming up. Ranges 10, 20, 30, 40, 50S; 1 to 59M; 1 to 180 Hrs		†
	Gas Units	Select from %, %LEL, PPB, or PPM.	N/A	

Table 31 Sensor X Setup Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION	OA	SMA
Cal	CalGasConc	Enter value for targeted gas. Value found on target gas cylinder. Accepts either %Volume, PPM, PPB or %LEL. For example, for Methane target gas, label indicates 2.5% (50%LEL). Range 0 to 100% of sensor range.	†	
	Period(DAYS)	Notifies when Calibration is needed. Range 0 to 1024.		†
	Span(SECS)	Prevents activation of alarm relays, faults and holding loop outputs while performing a Span Calibration. Range 0 to 1024		†
	Purge(SECS)	Enter the amount of time to allow the Span Gas to clear. Range 0 to 1024.		†
	Decimal	Number of decimal places in gas reading shown on LCD. Range 0, 1, or 2. Note: Range varies based on the installed sensor's range.	†	
	K Factor	Enter values for Combustible Cat-Bead Sensors. Default= 1.00 Range 0.10 to 1.50 See "Combustible Cat-Bead Sensor K-Factors" on page 143.		†

Table 31 Sensor X Setup Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION	OA	SMA
Alarms	AlarmX Set	Enter the Engineering Unit value. The Set is the gas concentration level at which the alarm (activates), trips. The Set and Reset values are used to define a range between the upper and lower trigger points. Set and Reset can be the same value. They address hysteresis. For example, if you are monitoring H_2S, you could make the Set 15 and the Reset 10. Conversely, if you are monitoring O_2, you could make the Set 19 and the Reset 20. This accommodates the different gas properties and provides you the flexibility to customize your settings. For Combustible: Range 0 to 60% of sensor range. For Toxic: Range 0 to 100% of sensor range.	†	
	AlarmX Reset	Enter the Engineering Unit value. The Reset is the gas concentration level at which the alarm (deactivates), clears. The Set and Reset values are used to define a range between the upper and lower trigger points. Set and Reset can be the same value. They address hysteresis. For example, if you are monitoring H_2S, you could make the Set 15 and the Reset 10. Conversely, if you are monitoring O_2, you could make the Set 19 and the Reset 20. This accommodates the different gas properties and provides you the flexibility to customize your settings. For Combustible: Range 0 to 60% of sensor range. For Toxic: Range 0 to 100% of sensor range. Note: Reset values cannot exceed their corresponding Set values.	†	
Editor	Name	Allows editing of the Sensor's Name (16 ASCII character Text String). Displays on the LCD.	†	
	Gas1	Allows editing of the Sensor's Gas 1 (8 ASCII character Text String). Displays on the LCD.	†	
	Gas2	Allows editing of the Sensor's Gas 2 (8 ASCII character Text String). Displays on the LCD.	†	
† Indicates the minimum User Access Level required to access this particular parameter. **Only applies to IR-Combustibles sensors.				

Table 32 Change User Access Setup Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION	OA	SMA
User Access	Operator	Allows changing the 4-digit access for Operator Access To change this parameter, you must already be at System Manager Level. If not, this parameter is RO. See Table 37.		†
	System Manager	Allows changing the 4-digit access for System Manager To change this parameter, you must already be at System Manager Level. If not, this parameter is RO. See Table 37.		†
† Indicates the minimum User Access Level required to access this particular parameter.				

Table 33 Backup/Restore Setup Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION	OA	SMA
Backup/Restore	Backup Settings	Yes – Performs backup No – Cancelled backup Note: Registers TX_OffsetMBSlaveAddress to TX_OffsetTXLongitude registers are all included in this function.		†
	Restore Settings	Yes – Performs restore No – Cancelled restore Note:Registers TX_OffsetMBSlaveAddress to TX_OffsetTXLongitude registers are all included in this function.		†
	Restore Factory	Enter – Performs factory restore Esc – Cancelled factory restore Note:The values are maintained for these registers: TX_OffsetTXModelNumber, TX_OffsetTXSerialNumber, TX_OffsetTXCodeVersion, TX_OffsetTXDataBaseVersion, TX_OffsetInhibitCurrent_FP32=3.8, TX_OffsetSensorsEnabled=1u. All others values are zero. Also, when a Restore is performed without a prior Backup, the Restore reflects the factory default values.		†
† Indicates the minimum User Access Level required to access this particular parameter.				

Configuring the Calibration Menu

This section covers the Calibration Menu.

Use the magnetic keys to navigate through the menu structure as necessary. See Figure 30. The parameters are detailed in Table 34.

Figure 30 Calibration Menu Structure

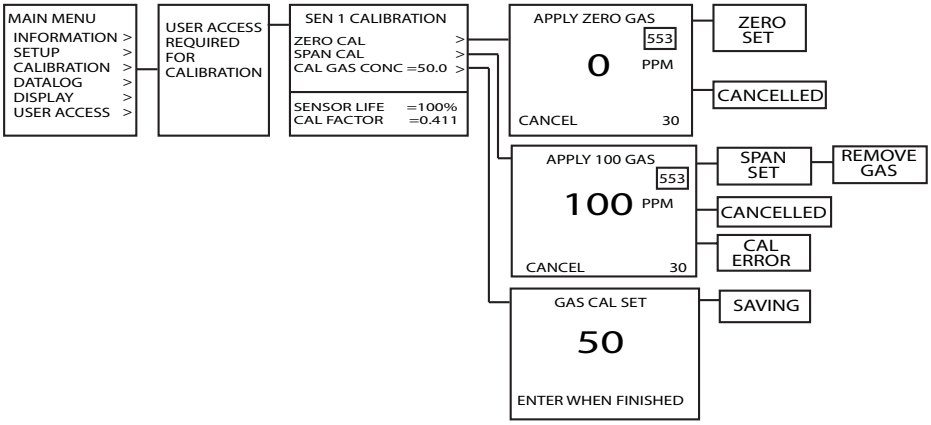


Table 34 Calibration Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION	OA	SMA
SensorX	Zero Cal	Activates Zero Calibration process, once Enter Key is hit. 30 second timer starts. Use Escape Key to Abort.	†	
	Span Cal	Activates Span Calibration process, once Enter Key is hit. 30 second timer starts. Use Escape Key to Abort.	†	
	Cal Gas Conc	Sets the amount of Cal Gas used based on the value found on the target gas cylinder, once Enter Key is hit. For example, for Methane target gas, label indicates 2.5% (50%LEL). The units of measure is Sensor dependent. Displays results: Saved, or Aborted. Use Escape Key to Abort.	†	
	Sensor Life	Displays the amount of Sensor Life remaining. Range 0 to 100%.	†	
	Cal Factor	Displays the resolution of the Sensor. The bigger the value the less sensitive the Sensor, conversely, the smaller the value the more sensitive the Sensor. Range 0.000 to 10.		†
† Indicates the minimum User Access Level required to access this particular parameter.				

Configuring the Datalog Menu

This section covers the Datalog Menu.

Use the magnetic keys to navigate through the menu structure as necessary. See Figure 31. The parameters are detailed in Table 35.

Figure 31 Datalog Menu Structure

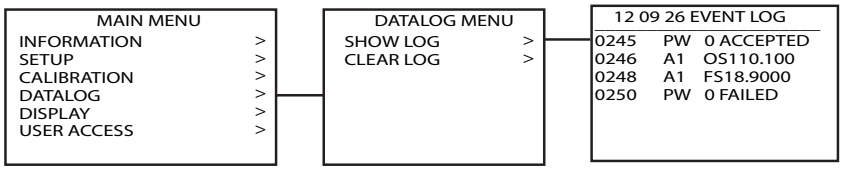


Table 35 Datalog Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION*
DataLog	Show Log*	Displays time stamped events. Events include: When device went in and out of Alarms and when device went in and out of Faults. YY MM DD: Year, month and day of the log. Each event line format is: HHMM: Hour and minutes from the date stamp, EC: Event Code from the logged event and EventData. EC EVENTDATA= DESCRIPTION SU YYMMDDHHMMSS=Startup SD YYMMDD=Set date, with YMD ST HHMMSS=Set time, with HMS FC Low Volts=Brownouts below 10V FC SV Mismatch=SV Mismatch FC XXXXXXXXWDog=SW WDT Fire FC XXXXXXXXDiag=Diag Safety FC MB_Address=MB Address Changed FC >1 HP Sensor=More than one high power sensor FC XXXXh SnF=Sensor fault LU Sn=Linkup, with S (Sensor number) Ax sss.s:rrr.s=Alarm set point/reset point (right after LU event) LD Sn=Linkdown, with S (Sensor number) IO Sn=Inhibit on, with S (Sensor number) or SYS IF Sn=Ihhibit off, with S (Sensor number) or SYS NW XXXXXXXXX=New sensor, with last 9 digits of serial number DW XXXXXXXXX=Diff sensor x, with last 9 digits of serial number Ax (O/F) Sn XXXXXX=Alarm x, with (On/oFf), S (123), (gascons) FA (O/F) Sn SSSS=Fault, with (On/oFf), S (123), (sensorstatus) GD YYMMDD=Get Date, with year, month, day GT HHMMSS=Get Time, with hour, minute, second RC XXXX=RCON bits, with (RCON). Reserved for Technical Support. CL =Clear log PW x accepted/Failed= X is user access level Sn GasConc=Only log when changed on screen TN TXName= TS TXSerialNumber= TV TXCodeVersion= RF =Restore factory default Rn No Latch:Fsafe=
	Clear Log*	Used to delete all current Logged Events.
* No user access required to access these particular parameters.		

Configuring the Display Menu

This section covers the Display Menu.

Use the magnetic keys to navigate through the menu structure as necessary. See Figure 32. The parameters are detailed in Table 36.

Figure 32 Display Menu Structure

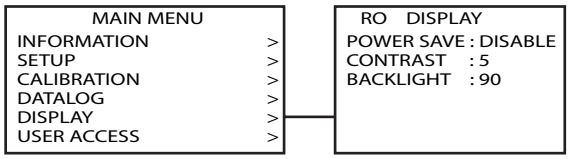


Table 36 Display Setup Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION	OA	SMA
LCD Setup	Power Save	Enable: Lights when any Key is hit and then times out to Save Power. Disabled: LCD stays on continuously.	†	
	Contrast	For adjusting the LCD's Contrast. Range 0 to 4.	N/A	
	Backlight	For adjusting the LCD's Backlight. Range 0 to 100.	N/A	
† Indicates the minimum User Access Level required to access this particular parameter.				

Configuring the User Access Menu

This section covers the User Access Menu.

Use the magnetic keys to navigate through the menu structure as necessary. See Figure 33. The parameters are detailed in Table 37.

Figure 33 User Access Menu Structure

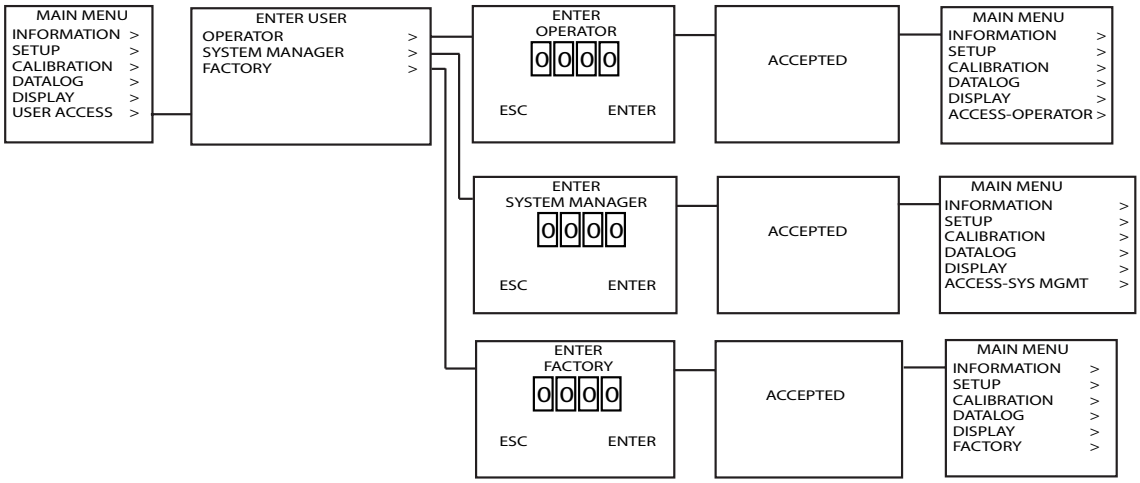


Table 37 User Access Menu Parameters

ITEM	SUB-ITEM	DESCRIPTION
User Access	Operator Access (OA)	Used to Enter Operator Access. Used to restrict access to certain parameters. Four (4) digit format. This setting times out after 5 minutes and then defaults to the Access Level. See Table 30.
	System Manager Access (SMA)	Used to Enter System Manager Access. Used to restrict access to certain parameters. Four (4) digit format. This setting times out after 5 minutes and then defaults to the Access Level. See Table 30.
	Factory	For Scott Safety internal use only.

Device Configuration Examples

This section provides some examples for selected parameters. Table 38 is a Combustible, Cat-Bead, Methane Sensor example. Table 39 is a Toxic, E-Chem, Carbon Monoxide Sensor example. Table 40 is a Toxic, E-Chem, Oxygen Sensor example.

Warning: *These are not to be used as recommendations for any application. Each application is unique and its settings will vary on a case by case basis. These are to provide some examples. When working in a potentially hazardous situation, which, if not avoided, could result in death or serious injury.*

Table 38 Combustible (LEL) Example – CH_4

CATEGORY	ITEM	SELECTION
Application	Sensor Technology	Cat-Bead
	Gas to Detect	CH_4 (Methane)
Displays Automatically when Sensor installed into Transmitter	Sensor 1 Methane New Sensor Reject Accept CH_4 50% Methane 0-100 Scale	Automatic
System	Sensors Enable	1
	Sensor #1	Online
	User Access	Enter 4-Digits
Sensor Calibration Setup	Cal Gas Conc	2.5% (50%LEL) from cylinder label
	Cal Gas Type	Methane
	Period (DAYS)	90
	Span (SECS)	180
	Purge (SECS)	60
	Decimal	0
	K Factor	1.00 for Methane
Sensor Calibration	Zero Calibration	Perform
	Span Calibration	Perform (CH_4 default Cal Gas)

Table 38 Combustible (LEL) Example – CH_4 (continued)

CATEGORY	ITEM	SELECTION
Transmitter	Alarm Logic	Latch
	Relay	Non-Failsafe (NO)
	Off Delay (MINS)	0
	Current Loops – 4mA Offset	0
	Current Loops – 20mA Offset	0
	Current Loops – Inhibit	3.8mA
	Time/Date	Set/Confirm
	Editor	Edit name, Lat or Long
Sensor	Range	100%
	Dead Band	0
	Display Negative	No
	Warm Up (SECS, MINS, HRS)	1M
	Gas Type	CH_4
	Gas Units	%
	Alarm Set 1	10% (default)
	Alarm Reset 1	9% (default)
	Alarm Set 2	25% (default)
	Alarm Reset 2	22% (default)
	Alarm Set 3	50% (default)
	Alarm Reset 3	45% (default)
	Editor – Name	Enter unique name
	Editor – Gas 1	Enter unique name
	Editor – Gas 2	Enter unique name
MODBUS	Address	1
	Baud Rate	9600
	Parity	None
	Stop Bit	1

Table 39 Toxic (E-Chem) Example – CO

CATEGORY	ITEM	SELECTION
Application	Sensor Technology	E-Chem
	Gas to Detect	CO (Carbon Monoxide)
Displays Automatically when Sensor installed into Transmitter	Sensor 1 Carbon Monoxide New Sensor Reject Accept CO 0PPM Carbon Monoxide 0-50 Scale	Automatic
System	Sensors Enable	1
	Sensor #1	Online
	User Access	Enter 4-Digits
Sensor Calibration Setup	Cal Gas Conc	20 to 80% Full Scale of setting
	Cal Gas Type	CO
	Period (DAYS)	90
	Span (SECS)	300
	Purge (SECS)	60
	Decimal	1
Sensor Calibration	Zero Calibration	Perform
	Span Calibration	Perform (CO default Cal Gas)
Transmitter	Alarm Logic	Non-Latch
	Relay	Non-Failsafe (NO)
	Off Delay (M)	1
	Current Loops – 4mA Offset	0
	Current Loops – 20mA Offset	0
	Current Loops – Inhibit	3.8 mA
	Time/Date	Set/Confirm
	Editor	Edit name, Lat or Long

Table 39 Toxic (E-Chem) Example – CO (continued)

CATEGORY	ITEM	SELECTION
Sensor	Range	0 to 50% is used in this example. Note: Another range of 0 to 10% is selectable.
	Dead Band	0
	Display Negative	No
	Warm Up (SECS, MINS, HRS)	1M
	Gas Type	Carbon Monoxide
	Gas Units	0 to 50PPM
	Alarm Set 1	5PPM (default)
	Alarm Reset 1	4.5PPM (default)
	Alarm Set 2	12.5PPM (default)
	Alarm Reset 2	11PPM (default)
	Alarm Set 3	27.5PPM (default)
	Alarm Reset 3	22.5PPM(default)
	Editor – Name	Enter unique name
	Editor – Gas 1	Enter unique name
	Editor – Gas 2	Enter unique name
MODBUS	Address	1
	Baud Rate	9600
	Parity	None
	Stop Bit	1

Table 40 Toxic (E-Chem) Example – O_2

CATEGORY	ITEM	SELECTION
Application	Sensor Technology	E-Chem
	Gas to Detect	O_2 (Oxygen)
Displays Automatically when Sensor installed into Transmitter	Sensor 1 Oxygen New Sensor Reject Accept O_2 20.9% Oxygen 0-25% Scale	Automatic
System	Sensors Enable	1
	Sensor #1	Online
	User Access	Enter 4-Digits
Sensor Calibration Setup	Cal Gas Conc	• Zero with N_2 (nitrogen) • Span with Zero Air
	Cal Gas Type	• Zero with N_2 (nitrogen) • Span with Zero Air
	Period (DAYS)	30
	Span (SECS)	300
	Purge (SECS)	60
	Decimal	1
Sensor Calibration	Zero Calibration	Perform with N_2
	Span Calibration	Perform (Zero Air Cal Gas)
Transmitter	Alarm Logic	Non-Latch
	Relay	Non-Failsafe (NO)
	Off Delay (MINS)	0
	Current Loops – 4mA Offset	0
	Current Loops – 20mA Offset	0
	Current Loops – Inhibit	17.38mA
	Time/Date	Set/Confirm
	Editor	Edit name, Lat or Long

Table 40 Toxic (E-Chem) Example – O_2 (continued)

CATEGORY	ITEM	SELECTION
Sensor	Range	0 to 25% is used in this example. Note: Another range of 0 to 10% is selectable.
	Dead Band	0
	Display Negative	No
	Warm Up (SECS, MINS, HRS)	1M
	Gas Type	Oxygen
	Gas Units	%
	Alarm Set 1	19.5% (default)
	Alarm Reset 1	20.5% (default)
	Alarm Set 2	16.0% (default)
	Alarm Reset 2	17.0% (default)
	Alarm Set 3	22.5.0% (default)
	Alarm Reset 3	21.0% (default)
	Editor – Name	Enter unique name
	Editor – Gas 1	Enter unique name
	Editor – Gas 2	Enter unique name
MODBUS	Address	1
	Baud Rate	9600
	Parity	None
	Stop Bit	1

Configuration Defaults

Table 41 provides the default settings and ranges for the device.

Table 41 Key Device Configuration Defaults

ITEM	SUB-ITEM 1*	SUB-ITEM 2*	FACTORY DEFAULT	CUSTOMER SETTINGS
TX Setup	Current Loops	Inhibit (ALL)	3.8mA	
TX Setup/Alarms	Alarm1	Logic	No Latch	
		Relay	Non-Failsafe	
		OFF Delay(M)	0	
	Alarm2	Logic	No Latch	
		Relay	Non-Failsafe	
		OFF Delay(M)	0	
	Alarm3	Logic	No Latch	
		Relay	Non-Failsafe	
		OFF Delay(M)	0	
TX Setup	MODBUS	MBAddress	0	
		Baud Rate	DIS	
		Parity	None	
		Stop Bit	0	
Sensor X Setup	General	Deadband %FS	Sensor dependent	
Sensor X Setup	General	Display Negative	NO	
Sensor X Setup	General	Warm Up (SECS)	Sensor dependent	
Sensor X Setup	Calibration	Span	300SECS (5mins)	
Sensor X Setup	Calibration	Purge	Sensor dependent	
Sensor X Setup	Alarms	Alarm1 Set	These default values are sensor dependent and its selected range. Examples of sensor Alarm settings are shown in: Table 38 on page 75, Table 39 on page 77 and Table 40 on page 79.	
		Alarm1 Reset		
		Alarm2 Set		
		Alarm2 Reset		
		Alarm3 Set		
		Alarm3 Reset		
User Access	Operator		0000	
	System Manager		0000	
*Note: Blank cells indicate no corresponding Sub-Item.				

For Sensor defaults and ranges, See "Combustible (LEL), IR, Cat-bead and MOS Sensor Specifications" on page 133. *See* "Toxic (E-Chem) Sensor Specifications" on page 135.

Using the MODBUS Registers

This section describes the MODBUS registers.

Warning: *Executing Write Register functions will alter external devices and thus their behavior. You must not write to any PLC address unless you understand the device performance or operation changes that will result and have determined that the changes will not create an unsafe situation. The following guidelines should be followed when changing MODBUS Registers: Only qualified personnel should make changes to MODBUS registers. Always test your changes in a test lab environment. Always verify your MODBUS Register changes prior to implementation in a functional plant environment. For Remote locations, verify all MODBUS changes function as intended prior to implementation in a functional plant environment. Failure to do so may result in serious injury or death.*

Details about the MODBUS Registers are provided in the following tables: Table 42 to Table 44. Table 44 is used with the following to determine the specific MODBUS register addresses: The offset for Sensor1 is 4096 (base in decimal) and 1000 (base in Hex), denoted as 0x1001, the offset for Sensor2 is 8192 (base in decimal) and 2000 (base in Hex), denoted as 0x2001, the offset for Sensor3 is 12288 (base in decimal) and 3000 (base in Hex), denoted as 0x3001. For example, to find the MODBUS register address for the data associated with GasConc for Sensor1, Table 44 shows D0 (Hex). The offset is 1000 (Hex) + D0 (Hex) is 4096 (decimal) + 208 (decimal) = 4304 (decimal). Next, take 4304 (decimal) + 40001 (decimal) = 44305 which is the MODBUS register address for the GasConc for Sensor1.

Table 42 MODBUS Registers — Transmitter Dynamic

REGISTER	HEX ADD.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	WIRED HART	WIRELESS HART & ISA100.11A
40002	1	R	Current TXTemperature -128 to +127°C	INT8U	1			
40081	50	R/W	TXCommand Bits 15-12 select the device: 1= Sensor 1 2= Sensor 2 3= Sensor 3 0= TX Some commands may have extra parameters, that is what TXParameter1-10 are for.	INT16U	2			
40082	51	R/W	TXCmdParameter1	INT16U	2			
40083	52	R/W	TXCmdParameter2	INT16U	2			
40084	53	R/W	TXCmdParameter3	INT16U	2			
40085	54	R/W	TXCmdParameter4	INT16U	2			
40086	55	R/W	TXCmdParameter5	INT16U	2			
40087	56	R/W	TXCmdParameter6	INT16U	2			
40088	57	R/W	TXCmdParameter7	INT16U	2			
40089	58	R/W	TXCmdParameter8	INT16U	2			
40090	59	R/W	TXCmdParameter9	INT16U	2			

Table 42 MODBUS Registers — Transmitter Dynamic (continued)

REGISTER	HEX ADD.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	WIRED HART	WIRELESS HART & ISA100.11A
40091	5A	R/W	TXCmdParameter10	INT16U	2			
40117	74	R	TXVoltage Voltage /10. Example: 241=24.1V	INT16U	2			Normal Alarm
40118	75	R	Alarm1Status bit=1: Sensor in alarm bit 0: sensor 1 bit 1: sensor 2 bit 2: sensor 3	INT16U	2			
40119	76	R	Alarm2Status bit=1: Sensor in alarm bit 0: sensor 1 bit 1: sensor 2 bit 2: sensor 3	INT16U	2			
40120	77	R	Alarm3Status bit=1: Sensor in alarm bit 0: sensor 1 bit 1: sensor 2 bit 2: sensor 3	INT16U	2			
40121	78	R	FaultStatus bit=1: fault bit0: sensor 1 bit1: sensor 2 bit2: sensor 3	INT16U	2			
40122	79	R	InhibitStatus bit=1: Sensor is in Inhibit bit0: sensor 1 bit1: sensor 2 bit2: sensor 3	INT16U	2			
40123	7A	R	CalStatus bit=1: Sensor Cal Due bit0: sensor 1 bit1: sensor 2 bit2: sensor 3	INT16U	2			
40124	7B	R	SensorConnected bit0: sensor 1 bit1: sensor 2 bit2: sensor 3	INT16U	2			
40129	80	R	RelayStatus bit0: Relay1 Status 1=Energized bit1: Relay2 Status bit2: Relay3 Status bit3: Relay4 Status bit7: GUI Edit Mode	INT16U	2			Normal Alarm
40130	81	R/W	CurrentHumidity	INT16U	2			

Table 42 MODBUS Registers — Transmitter Dynamic (continued)

REGISTER	HEX ADD.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	WIRED HART	WIRELESS HART & ISA100.11A
40132	83	R	TXStatus bit0: TX Fault (fault record holds the fault code) bit1: Loop1 current halt, 1=halt bit2: Loop2 current halt, 1=halt bit3: Loop3 current halt, 1=halt bit4: Spare bit5: System inhibit, 1=inhibit bit6: GUI Edit Mode bit7 - 10: undefined bit11: remote configuration lockout bits12 - 15 undefined	INT16U	2		System Inhibit	Normal Alarm
40133	84	R	TXOptions bit0: 2 wire bit1: 3-4 wire bit2: battery option bit3: wired HART expansion bit4: wireless HART expansion bit5: wireless ISA100.11A	INT16U	2			
40134	85	R	Sensor1SensorStatusHL High level status of sensor. bit0: Sensor enabled bit1: Alarm 1 trip bit2: Alarm 2 trip bit3: Alarm 3 trip bit4: Sensor fault bit5: Sensor inhibited bit6: Sensor connected bit7: Sensor calibrating bit8: Sensor Cal due bit9: Loop signaling (0=live, 1=fixed) bit10: Spare bit11: Spare bit12: Spare bit13: Spare bit 14, 15: Reserved	INT16U	2			Normal Alarm
40135	86	R	Sensor2SensorStatusHL	INT16U	2			Normal Alarm
40136	87	R	Sensor3SensorStatusHL	INT16U	2			Normal Alarm
40137	88	R	Sensor1GasConc10Bit 200 = 0%Full Scale, 1000 = 100% Full Scale, 0 = -25%Full Scale	INT16U	2	RD		
40138	89	R	Sensor2GasConc10Bit	INT16U	2	RD		
40139	8A	R	Sensor3GasConc10Bit	INT16U	2	RD		

Table 42 MODBUS Registers — Transmitter Dynamic (continued)

REGISTER	HEX ADD.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	WIRED HART	WIRELESS HART & ISA100.11A
40142	8D	R	CECStatus Lower byte:CEC1Status Upper byte:CEC2Status If 0=No CEC detected bit: 0=CEC EEPROM detected 1=CEC uP comms up 2=CEC requested DataBase 3=DB download complete 4=DB mismatch 5=DB CRC error 6=Protocol error 7=Undefined error	INT16U	2			
40177	B0	R/W	TXCurrentDate Transmitter's current date. BCD format: 00,year,month,day	INT32U	4		Tx Info Tx Setup	
40179	B2	R/W	TXCurrentTime Transmitter's current time. BCD format: 00,hour,min,sec	INT32U	4		Tx Info Tx Setup	
40257	100	R	Sensor1GasConc Linearized and temp compensated gas concentration. These values are floats that match the decimal place and displayed.	FP32	4	RD (byte order= BADC)	PV Main	Normal Alarm
40259	102	R	Sensor2GasConc	FP32	4	RD (byte order= BADC)	SV Main	Normal Alarm
40261	104	R	Sensor3GasConc	FP32	4	RD (byte order= BADC)	TV Main	Normal Alarm
40263	106	R	LoopCurrent1	FP32	4			
40265	108l	R	LoopCurrent2	FP32	4			
40267	10A	R	LoopCurrent3	FP32	4			
40337	150	R	Sensor1GasConcASCII 6 char string. This is what is displayed on the LCD, includes decimal point.	CHAR	8			
40341	154	R	Sensor1GasUnitsASCII 4 char string. This is what is on the display, gas units	CHAR	6			
40344	157	R	Sensor2GasConcASCII	CHAR	8			
40348	15B	R	Sensor2GasUnitsASCII	CHAR	6			

Table 42 MODBUS Registers — Transmitter Dynamic (continued)

REGISTER	HEX ADD.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	WIRED HART	WIRELESS HART & ISA100.11A
40351	15E	R	Sensor3GasConcASCII	CHAR	8			
40355	162	R	Sensor3GasUnitsASCII	CHAR	6			

Table 43 MODBUS Registers — Transmitter Configuration Parameters

REGISTER	HEX ADD.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	HART WIRED	HART WIRELESS & ISA 100.11A
40513	200	R	MBSlaveAddress TX MODBUS address, 1-247	INT08	1			
40514	201	R	MBSlaveBaudIndex TX MODBUS baudrate, 1 = 9600, 2=19200, 2 is default	INT08	1			
40515	202	R	MBSlaveParity TX MODBUS parity type 0 = none, 1 = odd, 2 = even, even is default When parity even/odd, 1 stop bit when parity none, 2 stop bits	INT08	1			
40516	203	R	MBSlaveStopBit TX MODBUS stop bits, 1 or 2	INT08	1			
40518	205	R/W	Regional Languages, Dates format, Daylight savings time bit3-0:Languages 0=English(en) 1=Spanish(es) 2=Portuguese(pt) 3=French(fr) 4=Russian(ru) 5=Chinese(zh) 6-15=Reserved bit5-4:Date format 0=MDY 1=DMY 2=YMD 3=Reserved bit7-6:Daylight saving time 0=Off 1=On 2=Reserved 3=Reserved	INT08	1			

Table 43 MODBUS Registers — Transmitter Configuration Parameters (continued)

REGISTER	HEX ADD.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	HART WIRED	HART WIRELESS & ISA 100.11A
40519	206	R/W	Alarm1Logic When latching, acknowledge is required bit0: 0 = nonlatching, 1 = latching bit1: 0 = nonfailsafe, 1 = failsafe	INT08	1		Tx Setup	
40520	207	R/W	Alarm2Logic	INT08	1		Tx Setup	
40521	208	R/W	Alarm3Logic	INT08	1		Tx Setup	
40522	209	R/W	SensorsEnabled 0= disabled 1= enabled bit 0: reserved bit 1: sensor 2 enabled bit 2: sensor 3 enabled bit 3: sensor 1 offline bit 4: sensor 2 offline bit 5: sensor 3 offline Note: When Sensor3 is enabled, then Sensor2 is enabled by the TX.	INT08	1		Main Tx Setup	
40523	20A	R/W	S1CurrentLoopOffset signed byte -128 to 127	INT08	1		Tx Setup	
40524	20B	R/W	S2CurrentLoopOffset	INT08	1		Tx Setup	
40525	20C	R/W	S3CurrentLoopOffset	INT08	1		Tx Setup	
40529	210	R	S3PrevGasType	INT08	1			
40530	211	R/W	S1CurrentLoop20mAOffset signed byte -128 to 127	INT08	1		Tx Setup	
40531	212	R/W	S2CurrentLoop20mAOffset	INT08	1		Tx Setup	
40532	213	R/W	S3CurrentLoop20mAOffset	INT08	1		Tx Setup	
40594	251	R/W	Alarm1OffTimeDelay This time, in seconds, is the delay on or off time for the alarm relay/LED pair. Max is 120 minutes (2 hours)	INT16U	2		Tx Setup	
40596	253	R/W	Alarm2OffTimeDelay This time, in seconds, is the delay on or off time for the alarm relay/LED pair.	INT16U	2		Tx Setup	
40598	255	R/W	Alarm3OffTimeDelay This time, in seconds, is the delay on or off time for the alarm relay/LED pair.	INT16U	2		Tx Setup	

Table 43 MODBUS Registers — Transmitter Configuration Parameters (continued)

REGISTER	HEX ADD.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	HART WIRED	HART WIRELESS & ISA 100.11A
40599	256	R/W	UserPassword (Access) Access for enabling operator level functions. binary: 4 digit number . Ie '0000'	INT16U	2			
40601	258	R/W	SysMgrPassword (Access) Access for enabling sys mgr functions. binary: 4 digit number . Ie '0000'	INT16U	2			
40607	25E	R	TXDataBaseVersion High byte major, low byte minor	INT16U	2			
40659	292	R/W	InhibitCurrent_FP32 The 4-20mA output that is sent when the device is in inhibit mode in .1mA steps.	FP32	4		Tx Setup	
40753	2F0	R/W	TXName User defined name/location 2 bytes per register - 16 chars ASCII and NULL, NULL. See Table 43.	CHAR	18		Tx Info	
40762	2F9	R	TXModelNumber Model Number 8 chars, ASCII	CHAR	10		Tx Info Tx Setup	
40767	2FE	R	TXSerialNumber sn: example 115Ayywwnnnnnn 115 is the company(Monroe) A is assembly (s is subassy) 08 is the year of manufacture 16 is the week of manufacture xxxxxx is the sequential number produced within the week. 14 chars ASCII	CHAR	16		Tx Info	
40775	306	R	TXCodeVersion Firmware version 4 chars, ASCII	CHAR	6		Tx Info	
40778	309	R/W	TXLatitude 10 chars. Null terminated	CHAR	12		Tx Setup	
40784	30F	R/W	TXLongitude 10 chars. Null terminated	CHAR	12		Tx Setup	

Table 44 MODBUS Registers — SensorX Data

BASE IN DECIMAL	BASE IN HEX.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	HART WIRED	HART WIRELESS & ISA 100.11A
40059	3A	R	ZeroOffset	INT16U	2		Sensor Gen Sensor Info	
40097	60	R	CurrentCalTemperature Updated by the sensor when span is complete. xx.x°C	FP32	4		Sensor Gen Sensor Info	
40103	66	R/W	CalGasConc Default is 50% FS	FP32	4		Sensor Setup	
40105	68	R	CurrentCalFactor Updated by the sensor after a successful span	FP32	4		Sensor Gen Sensor Info Sensor Cal	
40166	A5	R	SensorStatus bit0:Normal bit1:Set_Defaults (factory defaults) bit2:CRC_Fault bit3:Comb_Under_Volt_Fault (combust undervolt) bit4:Comb_Over_Fault (combust overvolt) bit5:Comb_Over_Rng (combustible overrange flag) bit6:Spare bit7:Spare bit8:Under_Volt_Fault (processor undervolts) bit9:Over_Volt_Fault (processor overvolts) bit10:Sensor_Fault (mainly ADC overrange) bit11:Spare bit12:NV_MEM_Fault (read verify failed after write) bit13:WDT_Fault bit14:Startup_Fault (EEPROM or proc DCO) bit15:IIC_Fault (I^2C bus error)	INT16U	2			
40167	A6	R	SensorVoltage (mV)	INT16U	2		Sensor Live	
40168	A7	R	GasAtoD 10bit, 0-1023, current AtoD output	INT16U	2		Sensor Live	
40209	D0	R	GasConc Linearized and temp compensated gas concentration	FP32	4		Sensor Live	
40211	D2	R	SensorTemp °C	FP32	4		Sensor Live	

Table 44 MODBUS Registers — SensorX Data (continued)

BASE IN DECIMAL	BASE IN HEX.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	HART WIRED	HART WIRELESS & ISA 100.11A
40289	120	R	GasType This is used by the sensor to determine which code to run. Each sensor will have a specified number. Toxics:1-127, IR & CB:128-255. Note: The values are used for internal purposes to identify sensors to the transmitter.	INT08U	1		Sensor Gen Sensor Setup	
40290	121	R	GasUnits	INT08U	1		Sensor Gen Sensor Setup	
40291	122	R/W	GasRangeIndex Indicates current Gas Range Upper nibble displays decimal point. Bits 0-3:Index to ranges/gain indexes. Bit4,5:1,2:display DP 0=0, 1=1, 2=2	INT08U	1		Sensor Setup	
40293	124	R/W	DisplayNegative Display negative or 0 when negative bit0:0=no, 1=yes	INT08U	1		Sensor Setup	
40294	125	R	SensorLife Percentage of sensor life left. 0-100	INT08U	1		Sensor Gen Sensor Info Sensor Cal	
40353	160	R	SensorWarmupTime The amount of time, in 10 seconds, that the sensor needs to warmup. Inhibit during this time. Seconds x 10.	INT16U	2		Sensor Setup	
40354	161	R	MfgCalTime Calibration times. hh:mm (BCD format)	INT16U	2			
40355	162	R	InstallCalTime Calibration times. hh:mm (BCD format)	INT16U	2			
40356	163	R	PriorCalTime Calibration times. hh:mm (BCD format)	INT16U	2			
40357	164	R	CurrentCalTime Calibration times. hh:mm (BCD format)	INT16U	2		Sensor Dates	
40358	165	R	MfgZeroOffset Zero offsets. ADC count	INT16U	2			
40359	166	R	InstallZeroOffset Zero offsets. ADC count	INT16U	2			

Table 44 MODBUS Registers — SensorX Data (continued)

BASE IN DECIMAL	BASE IN HEX.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	HART WIRED	HART WIRELESS & ISA 100.11A
40360	167	R	S1PriorZeroOffset Zero offsets. ADC count	INT16U	2			
40361	168	R/W	CalibrationPeriod Number of days between calibrations	INT16U	2		Sensor Setup	
40362	169	R/W	InhibitTimer This particular sensor inhibit timer. Used during Span. In Seconds (Min. of 5 Mins., Max. of 10Mins)	INT16U	2		Sensor Setup	
40363	16A	R/W	PurgeTimer Time after span that output is inhibited for this sensor. In Seconds (Min. of 5 Mins., Max. of 10Mins)	INT16U	2		Sensor Setup	
40376	177	R	GasRange0 lowest range. Range; lowest to highest Note:The number of ranges vary based on the sensor. The min and max. values vary based on the sensor.	INT16U	2		Sensor Setup	
40377	178	R	GainEunits0 Gain 1,0 & Eunits Split into 2 bytes: High byte:Reserved. The low byte is the Eunits. Eunits: 01=ppm 02=ppb 03=%LEL 04=%V/V bit7 indicates default range. Example: 0x0A01 Eunits=ppm	INT16U	2		Sensor Setup	
40378	179	R	S1MaxCalFactor0 Minimum acceptable cal factor	INT16U	2		Sensor Setup	
40379	17A	R	GasRange1	INT16U	2		Sensor Setup	
40380	17B	R	GainEunits1	INT16U	2		Sensor Setup	
40381	17C	R	MaxCalFactor1	INT16U	2		Sensor Setup	
40382	17D	R	GasRange2	INT16U	2		Sensor Setup	
40383	17E	R	GainEunits2	INT16U	2		Sensor Setup	
40384	17F	R	MaxCalFactor2	INT16U	2		Sensor Setup	

Table 44 MODBUS Registers — SensorX Data (continued)

BASE IN DECIMAL	BASE IN HEX.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	HART WIRED	HART WIRELESS & ISA 100.11A
40385	180	R	GasRange3	INT16U	2		Sensor Setup	
40386	181	R	GainEunits3	INT16U	2		Sensor Setup	
40387	182	R	MaxCalFactor3	INT16U	2		Sensor Setup	
40388	183	R	GasRange4	INT16U	2		Sensor Setup	
40389	184	R	GainEunits4	INT16U	2		Sensor Setup	
40390	185	R	MaxCalFactor4	INT16U	2		Sensor Setup	
40391	186	R	GasRange5	INT16U	2		Sensor Setup	
40392	187	R	GainEunits5	INT16U	2		Sensor Setup	
40393	188	R	MaxCalFactor5	INT16U	2		Sensor Setup	
40394	189	R	GasRange6	INT16U	2		Sensor Setup	
40395	18A	R	GainEunits6	INT16U	2			
40396	18B	R	MaxCalFactor6	INT16U	2			
40397	18C	R	GasRange7 Highest range	INT16U	2			
40398	18D	R	GainEunits7 Gain 1,0 & Eunits	INT16U	2			
40399	18E	R	MaxCalFactor7 Minimum acceptable cal factor	INT16U	2			
40449	1C0	R	MfgCalDate Calibration dates 00,yy,mm,dd (BCD format) (1st byte always 0x00)	INT32U	4		Sensor Dates	
40451	1C2	R	InstallCalDate Calibration dates 00,yy,mm,dd (BCD format) (1st byte always 0x00)	INT32U	4		Sensor Dates	
40453	1C4	R	PriorCalDate Calibration dates 00,yy,mm,dd (BCD format) (1st byte always 0x00)	INT32U	4		Sensor Dates	
40455	1C6	R	CurrentCalDate Calibration dates 00,yy,mm,dd (BCD format) (1st byte always 0x00)	INT32U	4		Sensor Dates	

Table 44 MODBUS Registers — SensorX Data (continued)

BASE IN DECIMAL	BASE IN HEX.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	HART WIRED	HART WIRELESS & ISA 100.11A
40529	210	R	KFactor This is the ratio between the calgastype and the gastype	FP32	4			
40531	212	R	MfgCalFactor Cal factors	FP32	4			
40533	214	R	InstallCalFactor Cal factors	FP32	4			
40535	216	R	PriorCalFactor Cal factors	FP32	4			
40537	218	R	MfgCalTemperature Cal temperatures xx.x°C	FP32	4			
40539	21A	R	InstallCalTemperature Cal temperatures xx.x°C	FP32	4			
40541	21C	R	PriorCalTemperature Cal temperatures xx.x°C	FP32	4			
40543	21E	R/W	Alarm1Setpoint Alarm set/reset points xx.x (defaults to a 10% of FS)	FP32	4		Sensor Setup	
40545	220	R/W	Alarm1ResetPoint Alarm set/reset points xx.x (defaults to a 9% of FS)	FP32	4		Sensor Setup	
40547	222	R/W	Alarm2Setpoint Alarm set/reset points xx.x (defaults to a 25% of FS)	FP32	4		Sensor Setup	
40549	224	R/W	Alarm2ResetPoint Alarm set/reset points xx.x (defaults to a 22% of FS)	FP32	4		Sensor Setup	
40551	226	R/W	Alarm3Setpoint Alarm set/reset points xx.x (defaults to a 50% of FS)	FP32	4		Sensor Setup	
40553	228	R/W	Alarm3ResetPoint Alarm set/reset points xx.x (defaults to a 45% of FS)	FP32	4		Sensor Setup	
40555	22A	R/W	NegativeFaultSetpoint x.x % (5% is max)	FP32	4			
40557	22C	R/W	Deadband x.x % (5% is max)	FP32	4		Sensor Setup	
40657	290	R/W	GasNameLine1 ASCII gas name	CHAR8	10		Sensor Setup	

Table 44 MODBUS Registers — SensorX Data (continued)

BASE IN DECIMAL	BASE IN HEX.	ACCESS	DESCRIPTION	DATA TYPE	#BYTES	7800	HART WIRED	HART WIRELESS & ISA 100.11A
40662	295	R/W	GasNameLine2 ASCII gas name	CHAR8	10		Sensor Setup	
40667	29A	R/W	SensorName User defined name/location	CHAR16	18		Sensor Setup	
40676	2A3	R	SensorModelNumber ASCII date. 2 bytes per register	CHAR8	10		Sensor Gen	
40681	2A8	R	SensorSerialNumber sn: ex 115Ayywwnnnnnn. 115 is the company(Monroe) A is assembly (s is subassy) 08 is the year of manufacture 16 is the week of manufacture xxxxxx is the sequential number produced within the week.	CHAR14	16		Sensor Gen	
40689	2B0	R	SensorCodeVersion 4 char string, ASCII	CHAR4	6			
40692	2B3	R	SensorProperties 8 char string, ASCII	CHAR8	10			

MODBUS Message Framing

This section provides an overview of the MODBUS Message Framing.

Standard MODBUS can be setup using either of three transmission modes: ASCII or RTU, or TCP.

In RTU mode, messages start with a silent interval of at least 3.5 character times. This is most easily implemented as a multiple of character times at the baud rate that is being used on the network. The first field then transmitted is the device address.

The allowable characters transmitted for all fields are hexadecimal 0 ... 9, A ... F. Networked devices monitor the network bus continuously, including during the silent intervals. When the first field (the address field) is received, each device decodes it to find out if it is the addressed device.

Following the last transmitted character, a similar interval of at least 3.5 character times marks the end of the message. A new message can begin after this interval.

The entire message frame must be transmitted as a continuous stream. If a silent interval of more than 1.5 character times occurs before completion of the frame, the receiving device flushes the incomplete message and assumes that the next byte will be the address field of a new message.

Similarly, if a new message begins earlier than 3.5 character times following a previous message, the receiving device will consider it a continuation of the previous message. This will set an error, as the value in the final CRC field will not be valid for the combined messages. Table 45 shows a typical message frame.

Table 45 MODBUS RTU Framing

START	ADDRESS	FUNCTION	DATA	CRC	END
3.5 Char time	8Bit	8Bit	N * 8Bit	16Bit	3.5 Char time
	The Address field of a message frame contains two characters (ASCII) or eight bits (RTU). The individual slave devices are assigned addresses in the range of 1 ... 247.	The Function Code field tells the addressed slave what function to perform. The following functions are supported by Modbus poll: 01 Read Coil Status 02 Read Input Status 03 Read Holding Registers 04 Read Input Registers 05 Write Single Coil 06 Write Single Register 15 Write Multiple Coils 16 Write Multiple Registers	The Data field contains the requested or send data.	Two kinds of error-checking methods (ASCII or RTU) are used for standard Modbus networks. The error checking field contents depend upon the method that is being used. When RTU mode is used for character framing, the error-checking field contains a 16-bit value implemented as two eight-bit bytes. The error check value is the result of a Cyclical Redundancy Check calculation performed on the message contents. The CRC field is appended to the message as the last field in the message. When this is done, the low-order byte of the field is appended first, followed by the high-order byte. The CRC high-order byte is the last byte to be sent in the message.	

Using the TXCommands

This section describes how to configure the device by modifying the MODBUS registers via the TXCommands.

Warning: *Executing Write Register functions will alter external devices and thus their behavior. You must not write to any PLC address unless you understand the device performance or operation changes that will result and have determined that the changes will not create an unsafe situation. The following guidelines should be followed when changing MODBUS Registers: Only qualified personnel should make changes to MODBUS registers. Always test your changes in a test lab environment. Always verify your MODBUS Register changes prior to implementation in a functional plant environment. For Remote locations, verify all MODBUS changes function as intended prior to implementation in a functional plant environment. Failure to do so may result in serious injury or death.*

The TXCommand is used to execute a MODBUS function and to set configuration parameters. The individual registers are readable at their address. To write a command/parameter to the transmitter a write to the MODBUS TXCommand is required. There are different write commands for the various data types. Some commands require only the TXCommand register to be written while other commands require addition parameters. They must be written to before the command is written into the command register. Details about the TXCommand structure and individuals TXCommands are provided in the following tables: Table 46 to Table 53. TX=0, Sensor1=1, Sensor2=2, Sensor3=3.

Consult the technical documentation provided with the receiving equipment in conjunction with the tables provided herein for configuration of MODBUS (WR and RD). The MODBUS register mapping may vary.

Table 46 Structure of Configuration Registers for TxCommand

CONFIGURATION REGISTERS
TXCommand
TXCmdParameter1
TXCmdParameter2
TXCmdParameter3
TXCmdParameter4
TXCmdParameter5
TXCmdParameter6
TXCmdParameter7
TXCmdParameter8
TXCmdParameter9
TXCmdParameter10

Table 46 Structure of Configuration Registers for TxCommand (continued)

CONFIGURATION REGISTERS
Note: Upper nibble defined. Bits 15-12 selects the device: 0= TX 1= Sensor1 2= Sensor2 3= Sensor3 Goes into high nibble of command and param1, when required.

Table 47 TxCommand 0xXXXX with No Parameters

TXCOMMAND	DESCRIPTION
0xX001 (The "X" refers to either sensor1, 2 or 3. For example, 0x1001 is for sensor1, 0x2001 is for sensor2, 0x3001 is for sensor3)	Zero Param1-10: N/A Examples: 0x1001= Zero Sensor1 0x2001=Zero Sensor2
0xX002	Span Param1-10: N/A Examples: 0x1002 Span Sensor1
0xX003	Inhibit (System and Sensor) Param1, bit15: 1=Inhibit, 0=Not inhibit Inhibit timer set to 5 Mins Examples: 0x1003 inhibit sensor1
0xX004	Reserved
0xX005	
0xX006	
0xX007	
0xX008	
0xX009	
0xX00A	
0xX00B	
0xX00C	
0xX00D	
0xX00E	
0x0020	Reset Transmitter
0x0300	AlarmAcknowledge
0x012A	Enter

Table 47 TxCommand 0xXXXX with No Parameters (continued)

TXCOMMAND	DESCRIPTION
0x013B	Escape

Table 48 TxWriteByte 0xX200 with Param1, Param2

TXCOMMAND	DESCRIPTION	PARAM1	PARAM2
0xX200	Write Byte (Sensor)	0xX000+ConfigRegisterAddress	Byte Data
		GasType (for IR Sensor only)	
		GasRangeIndex (for E-Chem Sensor only)	
		CalGasType	
		DisplayNegative	
0x0200	Write Byte (Transmitter)	Regional	Byte Data
		Alarm1Logic	
		Alarm2Logic	
		Alarm3Logic	
		SensorsEnabled	
		S1CurrentLoopOffset	
		S2CurrentLoopOffset	
		S3CurrentLoopOffset	
		S1CurrentLoop20mAOffset	
		S2CurrentLoop20mAOffset	
		S3CurrentLoop20mAOffset	
Note:Parameter1= Configuration register address. Parameter2= Byte data to write.			

Table 49 TxWriteUnit 0xX201 Upper Nibble with Param1, Param2

TXCOMMAND	DESCRIPTION	PARAM1	PARAM2
0xX201	Write Unit (Sensor)	0xX000+ConfigRegisterAddress	Unit Data
		CalibrationPeriod	
		PurgeTimer	
0x0201	Write Unit (Transmitter)	Alarm1OffTimeDelay	Unit DataS
		Alarm2OffTimeDelay	
		Alarm3OffTimeDelay	
		OperatorPassword (Access)	
		SysMgrPassword (Access)	
Note:Parameter1= Configuration register address. Parameter2= Unit data to write.			

Table 50 TxWriteLong 0xX202 with Param1, Param2, Param3

TXCOMMAND	DESCRIPTION	PARAM1	PARAM2	PARAM3
0xX202	Write Long (Sensor)	0xX000+ConfigRegister Address	Long Data Takes both Param2 & Param3. Format:B,A,D,C	
0x0202	Write Long (Transmitter)	TXCurrentDate	BCD format: 00,year,month,day	
		TXCurrentTime	BCD format: 00,hour,min,secs	
Note:Parameter1= Configuration register address. Parameter2= Long data to write. Parameter3= Long data to write.				

Table 51 TxWriteFloat 0xX203 Upper Nibble with Param1, Param2, Param3

TXCOMMAND	DESCRIPTION	PARAM1	PARAM2	PARAM3
0xX203	Write Float (Sensor)	0xX000+ConfigRegister Address	Float Data Takes both Param2 & Param3. Format: B,A,D,C	
		Alarm1Setpoint		
		Alarm1ResetPoint		
		Alarm2Setpoint		
		Alarm2ResetPoint		
		Alarm3Setpoint		
		Alarm3ResetPoint		
		NegativeFaultSetpoint		
		Deadband		
0x0203	Write Float (Transmitter)	Inhibit Current	Float Data Takes both Param2 & Param3. Format: B,A,D,C	
Note:Parameter1= Configuration register address. Parameter2= Float data to write. Parameter3= Float data to write.				

Table 52 TxWriteString 0xX204 Upper Nibble with Param1 ... Param10 (1 of 2)

TXCOMMAND	DESCRIPTION	PARAM1	PARAM2	PARAM3	PARAM4	PARAM5	PARAM6
0xX204	Write String (Sensor)	ConfigRegisterAddress					
		GasNameLine1	1st,2nd	3rd,4th	5th,6th	7th,8th	Null, Null
		GasNameLine2	1st,2nd	3rd,4th	5th,6th	7th,8th	Null, Null
		SensorName	1st,2nd	3rd,4th	5th,6th	7th,8th	9th,10th
0x0204	Write String (Transmitter)	TXName	1st,2nd	3rd,4th	5th,6th	7th,8th	9th,10th
		TXLatitude	1st,2nd	3rd,4th	5th,6th	7th,8th	9th,10th
		TXLongitude	1st,2nd	3rd,4th	5th,6th	7th,8th	9th,10th
Note:Parameter1= Configuration register address. Parameter2 ... Parameter10= String data to write (ASCII).							

Table 53 TxWriteString 0xX204 Upper Nibble with Param1 ... Param10 (2 of 2)

TXCOMMAND	DESCRIPTION	PARAM1	PARAM7	PARAM8	PARAM9	PARAM10
0xX204	Write String (Sensor)	ConfigRegisterAddress				
		GasNameLine1				
		GasNameLine2				
		SensorName	11th,12th	13th,14th	15th,16th	Null, Null
0x0204	Write String (Transmitter)	TXName	11th,12th	13th,14th	15th,16th	Null, Null
		TXLatitude	11th,12th	Null, Null		
		TXLongitude	11th,12th	Null, Null		
Note:Parameter1= Configuration register address. Parameter2 ... Parameter10= String data to write (ASCII).						

Chapter 5

SCOTT OPERATION

Chapter Overview

This chapter covers the following topics:

- Operating the Device
- Powering Up
- Powering Down

Operating the Device

This section describes the operational modes of the device. Primary User Interface (UI) of the device is via the LCD. During operation, the LCD displays continuous data on gas concentrations and alarm conditions and access to the Main Menu. Optionally, a device with no LCD is available for remote locations.

Warning: *When settings are changed, ensure those changes are communicated to all affected personnel.*

The device defaults to the Text and Numerical Display upon power up. This display shows real time data to you. Specifically, the current numerical value of gas concentration shown in engineering units.

Navigation of the LCD displays are done by using the supplied magnetic tool with the four (4) navigation keys (UP, ESCAPE, DOWN, and ENTER/MENU). You do not need to remove the removable cover of the housing to activate these keys. The magnetic tool works in close proximity to the four (4) keys. Additionally, the magnetic tool must be removed and replaced to perform sequential key routines. Use a sweeping motion rather than an hitting move to activate the keys.

Figure 34 shows the Text and Numerical Display, as well as the navigation keys and the devices' LEDs. Additionally, Table 54 lists these items along with their descriptions. Figure 35 shows the Main Menu. Figure 36 Graphical Trending Display. Figure 37 shows the Blind LCD.

See "Configuration and Setup" on page 53.

Figure 34 Text and Numerical Display

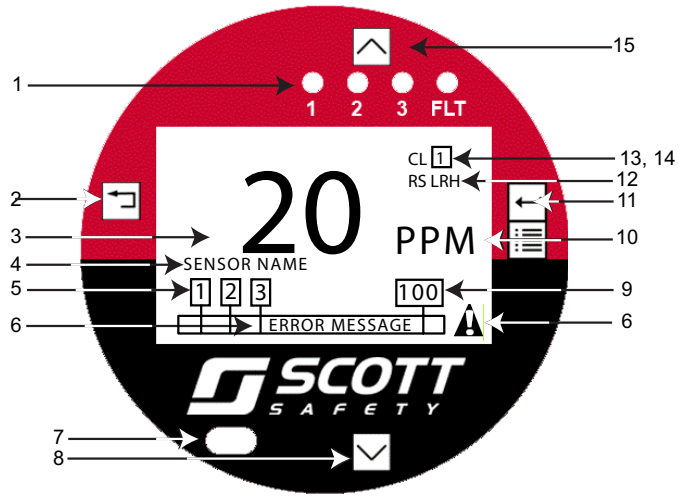


Table 54 LCD Items and Descriptions

REFERENCE NUMBER	ITEM	DESCRIPTION
1	ALARM1	Indicates an alarm condition when Red LED Flashes. This LED functions in tandem with equipment configured to Relay (K1). To acknowledge this alarm, press any Key and this LED changes from flashing to solid. Note: This LED functions regardless of whether the Relays are used externally or not.
	ALARM2	Indicates an alarm condition when Red LED Flashes. This LED functions in tandem with equipment configured to Relay (K2). To acknowledge this alarm, press any Key and this LED changes from flashing to solid. Note: This LED functions regardless of whether the Relays are used externally or not.
	ALARM3	Indicates an alarm condition when Red LED Flashes. This LED functions in tandem with equipment configured to Relay (K3). To acknowledge this alarm, press any Key and this LED changes from flashing to solid. Note: This LED functions regardless of whether the Relays are used externally or not.
	FAULT	Indicates an fault condition when Amber LED Flashes. Faults include: Under Range, Over Range, Sensor Offline, and Sensor Faults. This LED functions in tandem with equipment configured to Relay (K4). Note: This LED functions regardless of whether the Relays are used externally or not.
2	ESCAPE and Short Cut	Key used to navigate previous menus. Key Short Cut – Sensor Calibration. Hold magnetic tool over this key to activate for 5 Seconds. This parameter is Password protected.
3	GAS CONCENTRATION	Displays the concentration of the gas.
4	SENSOR NAME	Displays Sensor Name as entered. Displays the active Sensor. Up to 18 characters maximum.
5	ALARM SETPOINTS	Displays Alarm Set Point value settings. These coincide with ALARM1, ALARM2 and ALARM3 respectively.

Table 54 LCD Items and Descriptions (continued)

REFERENCE NUMBER	ITEM	DESCRIPTION
6	ERROR MESSAGE & ICON	Typically displays fault message with Icon. Includes: • Under Range (-RNG) and FAULT LED • Over Range (+RNG) and FAULT LED • Cal Required • Sensor Faults and FAULT LED See “Troubleshooting the Device” on page 126.
	SENSOR INHIBIT	Alarm Inhibit Icon. Applies to only a single Sensor. Displays during power up, during Zero and Span Calibration.
	SYSTEM INHIBIT	Alarm System Inhibit Icon (with “S”). Applies to all three (3) Sensors. Displays after pressing the ESC key for 3 seconds.
7	IR TX/RX Port	Used to upgrade the device’s firmware. (Future feature)
8	DOWN and Short Cut	Key is used to navigate between Text and Numerical Display and the Graphical Trending Display (2Minute, 60Minute, 1Day and 7Day) with the magnetic tool. And also maneuvers between the four (4) Graphical Trending Displays. See Figure 34 and Figure 36. DOWN key maneuvers the Arrow/Cursor. Individual items, such as a numerical value or ASCII characters are changed using the DOWN key to change the character.
9	GAS RANGE	Displays the full scale range of the gas.
10	UNIT of MEASURE	Displays the unit of measure of the gas.
11	ENTER/MENU	Key used to navigate from Gas Monitoring Screen to the Main Menu Screen, among sub-menu screens and to select an individual item from the Menu.
12	SENSOR CHARTERISTICS	Displays additional sensor characteristics, if applicable. For example, RS LRH means Rock Solid, Low Relative Humidity.
13	GAS TYPE	Displays applicable gas type entered. Up to 8 characters maximum per line. For example, CL_2.

Table 54 LCD Items and Descriptions (continued)

REFERENCE NUMBER	ITEM	DESCRIPTION
14	SENSOR NUMBER	For multi-sensors, displays the applicable sensor number (1, 2 or 3) that corresponds to the current information shown. When a sensor faults, its corresponding number flashes.
15	UP and Short Cut	Key is used to navigate between LCD configuration screens with the magnetic tool. For multi-sensors, maneuvers between the applicable sensor number (1, 2 or 3) for both Text and Numerical Display and the Graphical Trending Display. See Figure 34 and Figure 36. UP key maneuvers among the individual items, such as a numerical value or ASCII characters are changed using the UP key to change the character.

Figure 35 Main Menu Display

Figure 36 Graphical Trending Display

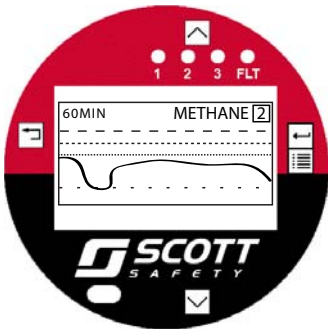


Figure 37 Blind LCD

The device ships pre-configured for standard operation. However, if an Optional Communication PCB is installed in the device, you may need to change some of the configuration parameters. See "Configuration and Setup" on page 53.

Upon initial completion of the power up sequence, the device needs to be Calibrated to ensure proper operation of the Sensor. See "Calibrating the Device" on page 108.

Powering Up

This section covers the power up sequence.

Once power is applied to the device, the four (4) LEDs emit solid, the LCD displays SCOTT Safety logo, Unit Information screens displays briefly (System Name, Model, Code, SN#), Waiting for System to Initialize screen displays with progress bar, then the Text and Numerical Display appears. The boot up process takes about eight (8) seconds to complete.

Caution: *Calibrate the device prior to placing into operation.* See "Calibrating the Device" on page 108.

Warning: *To avoid the possible need of re-calibrating a calibrated sensor, when powering the device for the first time, do so with the sensor not installed. Verify device date and time and correct if necessary. When installing sensor, again verify correct date and time of device prior to accepting sensor.*

Powering Down

This section covers the power down sequence.

Powering down the device is not required to perform routine operations.

Chapter 6

SCOTT MAINTENANCE

Chapter Overview

This chapter covers the following topics:

- Calibrating the Device
- Maintaining the Device
- Troubleshooting the Device

Calibrating the Device

This section covers calibration of the device.

Warning: *All Sensors shipped with the device are calibrated at the factory. However, verify that Spare Sensors are calibrated prior to use.*

Warning: *Operating the device that has exceeded its calibration date can cause false readings of detected gases. Readings obtained while device is out of calibration are invalid and could lead to death or injury.*

Warning: *During Calibration, the device is not detecting hazardous gases. Ensure you notify affected personnel working in the area or otherwise depending on its detection that it will be out of service and ensure other gas detection protection is in place.*

Warning: *Before you begin, read and understand the MSDS and warning labels for the calibration gases. Failure to do so may result in serious injury or death.*

Warning: *Local alarms are inhibited in the device while in Calibration Mode (that is, a time delay set to prevent unwanted alarm trips). Verify the environment is clean and free of hazardous gases and toxins or have monitoring performed by another device prior to calibrating. Failure to do so could lead to injury or death. See* "Configuring the Setup Menu" on page 62.

Calibration Hookup

This section describes Calibration Hookup.

There are two (2) Hookup options for Calibrating the Sensors for both Zero Calibration and Span Calibration. They are:

- Using the 1/4 Turn Calibration Fitting
- Using the Calibration Port on the Sensor Head with the Remote Calibration Quick Disconnect Fitting

Figure 38 shows the required equipment for the Hookup options.

Various Calibration Kits are available to accommodate different applications. See "Parts List" on page 160.

Figure 38 Calibration Hookup Method - Both Hookup Options

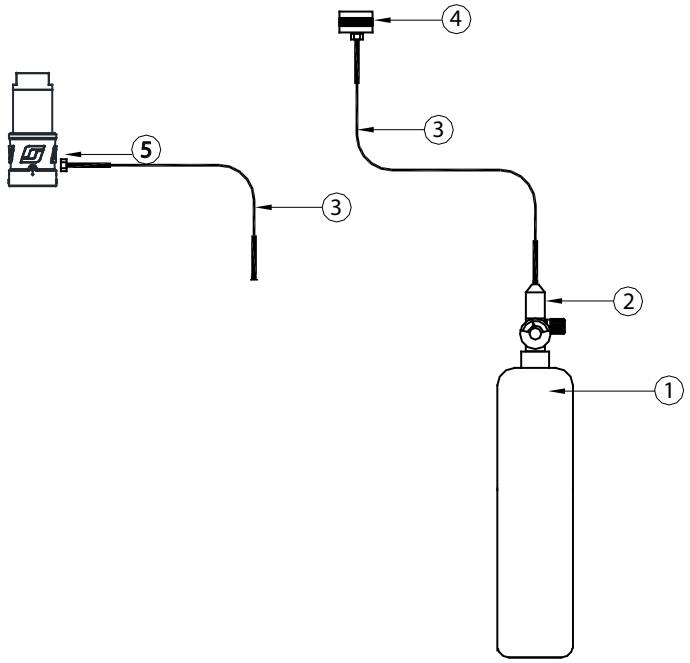


Table 55 lists the required equipment for both Hookup options.

Table 55 Calibration Hookup Equipment

REFERENCE NUMBER	ITEM	USING CAL. ADAPTER	USING CAL. PORT ON SENSOR HEAD
1	Gas Cylinder • For Zero Gas Calibration: Zero Gas Cylinder • For Span Gas Calibration*: Contact your Scott sales representative or Scott Safety. See “Technical Service” on page 158. OR • For Span Gas Calibration*:See “Sensor Information” on page 139.	Same	Same
2	Regulator (Male or Female) See “Parts List” on page 160.	Same	Same
3	• Tygon Tubing*, 3/16” ID Soft • Teflon Type Tubing*, Hard (For sticky gases like HCl and NH_3) • Nafion Tubing (For MOS Sensors) See “Parts List” on page 160.	Same	Same
4	1/4” Turn Calibration Fitting	Applicable	N/A
5	Sensor Head (Cal Port)	N/A	Applicable

Table 55 Calibration Hookup Equipment (continued)

REFERENCE NUMBER	ITEM	USING CAL. ADAPTER	USING CAL. PORT ON SENSOR HEAD
* For Reactive Gases, use a Calibration Gas with a tolerance of + /- 2 % and a Teflon Type Tubing. For Non-Reactive Gases, use a Calibration Gas with a tolerance of +/- 5% and a Tygon Type Tubing. Note: Various Calibration Kits are available. See "Parts List" on page 160.			

Calibration Methods

This section describes the various calibration methods.

Scott Safety recognizes the potential of the device as a life saving device when operated and maintained correctly. As such, verifying proper operation of the device in the form of Span Calibration and Zero Calibration is essential to ensure the device performs as intended in a potentially hazardous environment.

The frequency at which Span Calibration and Zero Calibration occur is best determined based on local regulatory standards, company policies, and industry best practices. Scott Safety is not responsible for setting policies or practices.

Table 57 provides typical recommended calibration frequency guidelines.

Table 56 Recommended Calibration Frequency Guidelines

SENSOR TYPE	FREQUENCY	CALIBRATION METHOD
Cat-Bead	Quarterly (3 months)	Zero and Span
IR	Twice per year (6 months)	
E-Chem	Quarterly (3 months)	
Oxygen	Every 30 days (1 month)	
MOS	Quarterly (3 months)	Low and High Span

Calibration methods include the following:

- Zero Calibration — Is performed to establish baseline readings of atmospheres that are known to be free of toxic or combustible gases.
- Span Calibration — Is performed to ensure the device detects target gases within specified operating parameters. Span Calibration is the adjustment of the device's response to match a known concentration of gas. Sensors can lose sensitivity through normal degradation, exposure to high gas concentrations, or sensor poisoning. Accurate calibration can be achieved only if specific concentrations of the correct gases are used. Span Calibration should be performed when a new sensor is installed. Span Calibration must be performed anytime a Bump Test fails. Typically, Zero Calibration is performed prior to a Span Calibration.

Warning: *During Calibration, the device is not detecting hazardous gases. Thus, gas monitoring and alarm processing are not performed. When the primary device is off line, ensure you have another online device to actively detect hazardous gases. Failure to do so could result in injury or death.*

If using the Relays, local Alarm Relays are Inhibited during the Calibration Mode. Inhibit Time is an adjustable parameter. See "Configuring the Setup Menu" on page 62.

Table 57 details the recommended calibration and test items for the device.

Table 57 Recommended Calibration Matrix

ITEM	FREQUENCY	DETAILS
Zero Calibration	• When baseline readings are incorrect or suspect • Prior to a Span Calibration	See "Zero Calibration" on page 111.
Span Calibration	• After installing new sensors	See "Span Calibration" on page 112.

Zero Calibration

This section describes how to perform Zero Calibration.

Prior to starting the Zero Calibration procedure, you may need to adjust the Inhibit Time on the device. This prevents unwanted alarm trips. Likewise remember to reset it after calibration. See "Configuring the Setup Menu" on page 62.

A OPERATOR ACCESS or higher must be entered to perform a Zero Calibration.

1. To temporally change the access. From the Text and Numerical Display, enter the Main Menu by pressing the ENT/MENU key using the supplied magnetic tool. Press the DN key to USER ACCESS, press the ENT/MENU key, select OPERATOR, press ENT/MENU key, press either UP or DN keys to enter 4-digit access, press ENT/MENU key, until ACCEPTED displays.
2. Optionally, you could now proceed to permanently change the access to OPERATOR or higher. From the Text and Numerical Display, enter the Main Menu by pressing the ENT/MENU key, select SETUP, Select CHANGE ACCESS CODE, enter 4-digit access, press ESC key until returns to the Text and Numerical Display.
3. Apply calibration gas using the Calibration Adapter. The calibration gas and its flow depends on the sensor. See Table 58.

Table 58 Gases and Flow Rates for Zero Calibration for Sensor Type

SENSOR TYPE	GAS	FLOW RATE (LPM)
Cat-Bead	Zero Air*	0.5**
IR	Zero Air, or Nitrogen	
E-Chem (Oxygen)	Nitrogen	0.5
E-Chem (Others)	Zero Air	
*Zero Air is 20.9% O_2 and the balance Nitrogen. **Standard recommended rate is 0.5. However, some applications, such as remote sensor, may require 1.0, which is acceptable. Note: A flow rate either above or below can result in a failed or inaccurate calibration.		

4 Wait at least 3 to 5 minutes for stabilized readings.

5 To perform Zero Calibration, from the MAIN MENU, select CALIBRATION, select ZERO CAL, press ENT/MENU key, APPLY ZERO GAS screen displays, the 30 second timer starts.

6 After a successful Zero Cal, press ENT/MENU key to accept. ZERO SET, then SENSOR X CALIBRATION displays. Press ESC key twice to return to Text Numerical Display.

7 If the sensor's output is higher than expected, ZERO ANYWAY? displays and flashes, then press ENT/MENU key to ACCEPT, ZERO SET displays. If Zero Calibration fails, repeat procedure until successful. Press ESC key twice to return to Text and Numerical Display.

If 5 minutes elapses before Zeroing the device, the device times out and returns to the Text and Numerical Display. If this happens just reselect CALIBRATION. To keep the time out from occurring, press either the UP or DN keys. The 5 minute time out starts over after a key is activated. If more time is required for specific gases, adjust the Span Time parameter.

8 Remove Calibration Gas.

9 If Span calibration is desired, continue to See "Span Calibration" on page 112.

Span Calibration

This section describes how to perform Span Calibration.

Prior to starting the Span Calibration procedure, you may need to adjust the Inhibit Time on the device. This prevents unwanted alarm trips. Likewise remember to reset it after calibration. See "Configuring the Setup Menu" on page 62.

Verify concentration level matches detection set points of the device and the expiration date of the cylinder has not passed.

If the target gas concentration is not available for an E-Chem sensor, the sensor range may be changed. See "Changing the E-Chem Sensor's Range" on page 116.

For the Combustible IR Sensor (096-3473-56), the target gas may be selected based on your application. See "Selecting the Combustible IR Sensor's Target Gas" on page 116.

For the Combustible Cat-Bead Sensor (096-3473-55), the K-Factor field may be changed to match the target gas based on your application. See "Combustible Cat-Bead Sensor K-Factors" on page 143.

A USER ACCESS or higher must be entered to perform a Span Calibration.

1 To temporary change the access. From the Text and Numerical Display, enter the Main Menu by pressing the ENT/MENU key using the supplied magnetic tool. Press the DN key to USER ACCESS, press the ENT/MENU key, select

OPERATOR, press ENT/MENU key, press either UP or DN keys to enter 4-digit access, press ENT/MENU key, until ACCEPTED displays.

2 Optionally, you could now proceed to permanently change the access to OPERATOR or higher. From the Text and Numerical Display, enter the Main Menu by pressing the ENT/MENU key, select SETUP, Select CHANGE ACCESS CODE, enter 4-digit access, press ESC key until returns to the Text and Numerical Display.

3 Determine the target calibration gas based on Sensor type. Different Sensors target different gases. Ensure the Span Gas being used is applicable to the Sensor installed. See Table 59 and Table 60.

Table 59 Gases and Flow Rates for Span Calibration for Sensor Type

SENSOR TYPE	GAS	FLOW RATE (LPM)
Cat-Bead	See "Combustible Cat-Bead Sensor K-Factors" on page 143.	0.5**
IR	Use target gas. See "Combustible IR Sensor Surrogate Test Gas" on page 148.	
E-Chem (Oxygen)	Use Zero Air.*	0.5
E-Chem (Others)	If available, use target gas.	
*Zero Air is 20.9% O_2 and the balance Nitrogen. **Standard recommended rate is 0.5. However, some applications, such as remote sensor, may require 1.0, which is acceptable. Note: A flow rate either above or below can result in a failed or inaccurate calibration.		

Table 60 Gases and Flow Rates for Span Calibration for MOS Sensor

SENSOR TYPE	GAS	SPAN	FLOW RATE
MOS	10PPM H_2S	Low	300CCM
	50PPM H_2S	High	
Note: This is a two step operation; you can not do just low or high span, must do both to complete calibration. Note: We recommend using Nafion Tubing for best results with MOS Sensors.			

4 Attach the Calibration Adapter to the device and apply gas from the regulator.

5 Apply the applicable Calibration Gas.

6 Wait at least 3 to 5 minutes for stabilized readings.

7 To perform Span Calibration, from the MAIN MENU, select CALIBRATION, select SPAN CAL, press ENT/MENU key, APPLY XX GAS screen displays, the 30 second timer starts as gas is applied.

8 After a successful SPAN CAL, press ENT/MENU key to ACCEPT. SPAN SET, REMOVE GAS, then after gas is removed SENSOR X CALIBRATION displays. Press ESC key twice to return to Text and Numerical Display.

If 5 minutes elapses before Spanning the device, the device times out and returns to the Text and Numerical Display. If this happens just reselect CALIBRATION. To keep the time out from occurring press either the UP or DN keys. The 5 minute time out starts over after a key is activated. If more time is required for specific gases, adjust the Span Time parameter.

Maintaining the Device

This section covers maintenance of the device.Table 61 details the recommend maintenance item for the device.

Table 61 Recommended Maintenance Matrix

ITEM	ACTIVITY	FREQUENCY	DETAILS
Sensor	Replace	Periodic	See "Replacing the Sensor" on page 115.
E-Chem Sensor	Change	As needed	See "Changing the E-Chem Sensor's Range" on page 116.
Combustible IR Sensor	Change	As needed	See "Selecting the Combustible IR Sensor's Target Gas" on page 116.
Intrinsically Safe (IS) Barrier PCB	Replace	As needed	See "Replacing the Intrinsically Safe (IS) Barrier PCB" on page 116.
Power Supply PCB (3-4 Wire)	Replace	As needed	See "Replacing the Power Supply PCB (3-4 Wire)" on page 118.
Power Supply PCB (2 Wire)	Replace	As needed	See "Replacing the Power Supply PCB (2 Wire)" on page 119.
4-20mA Loop Trimming	Adjustment	Initial installation & As needed	See "Trimming the 4-20mA Loop" on page 119.
Terminal/Relay/ MODBUS RS-485 PCB	Replace	As needed	See "Replacing the Terminal/Relay/MODBUS RS-485 PCB" on page 120.
LCD PCB/CPU PCB	Replace	As needed	See "Replacing the LCD PCB/CPU PCB" on page 121.
Meridian NPT Ex Seal	Replace	As needed	See "Replacing the Meridian NPT Ex Seal" on page 121.
Meridian Detector Body Assembly	Replace	As needed	See "Replacing the Meridian Detector Body Assembly" on page 123.
Sensor Mapping	As needed	As needed	See "Re-Mapping the Sensors" on page 124.
Sensor Fault	As needed	As needed	See "Clearing a Sensor Fault" on page 125.

Replacing the Sensor

This section provides information on how to replace Sensors.

The device ships without the Sensor installed and must be installed prior to use. The procedure to install your Sensor is the same to replace your Sensor.

1 To replace a Sensor, *See* "Installing/Replacing a Sensor" on page 50.

2 Perform Zero and Span Calibrations of the device. See "Zero Calibration" on page 111. See "Span Calibration" on page 112.

Changing the E-Chem Sensor's Range

This section provides information on how to change the E-Chem sensor's Range.

1 System Manager access level is required. The path is MAIN MENU/USER ACCESSS/SYSTEM MANAGER. Enter the four digits and select ENT/MENU key. See "Configuring the User Access Menu" on page 74.

2 Access the Setup Menu via the Main Menu. See "Configuring the Setup Menu" on page 62. The path is MAIN MENU/SETUP/SENSOR X SETUP/GENERAL/GAS RANGE. Select ENT/MENU and select desired range, then select ENT/MENU, ESC, Save Changes and back out of menu. Gas Range varies based on installed Sensor. For example, for a CO Sensor the Default range is 50, but you may select either 100 or 1000 as its range.

Warning: *Range should only be changed in clean air. Changing the Senor's Gas Range automatically changes its Set and Reset Alarm settings. Each Gas Range has its own unique corresponding Set and Reset values. Therefore, ensure you verify these settings after changing the sensor's Gas Range.*

Selecting the Combustible IR Sensor's Target Gas

This section provides information on how to select the target gas when using the Combustible IR Sensor's Range (096-3473-56). This sensor allows the selection of different target gases.

1 System Manager access level is required. The path is MAIN MENU/USER ACCESSS/SYSTEM MANAGER. Enter the four digits and select ENT/MENU key. See "Configuring the User Access Menu" on page 74.

2 Access the Setup Menu via the Main Menu. See "Configuring the Setup Menu" on page 62. The path is MAIN MENU/SETUP/SENSOR X SETUP/GENERAL/GAS RANGE. Select ENT/MENU and select desired target gas, then select ENT/MENU, ESC, Save Changes and back out of menu, after selecting from the different target gases selections.

3 The Cal Required message appears after detecting a new combustible gas being loaded. Perform a Span Calibration at this point, since no changes can take effect until this is done.

These selections only appear when the Combustible IR Sensor is present in the system.

Replacing the Intrinsically Safe (IS) Barrier PCB

This section provides information on how to replace Intrinsically Safe (IS) Barrier PCB. There are two (2) Intrinsically Safe (IS) Barrier PCBs, one for 3-4 Wire and another for 2 Wire transmitters.

Warning: *Ensure Receivers and Power Supplies are not powered when installing PCB into the device. Failure to do so could result in injury or death.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1 Ensure Receivers and Power Supplies are not powered when installing wire to the device.

2 Unscrew the setscrew and the Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.

3 Remove the two (2) wires from TB1.

It is not necessary to remove the Wire Ribbon Cable from the upper and lower PCB stack.

4 Disconnect the tops of the plugs for any other terminal blocks in use (MODBUS, Alarms, Fault, and Remote Acknowledge).

5 Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.

6 Unscrew the two (2) retention screws on the light blue IS TB on the IS PCB and remove the top of the plug.

7 Unscrew the two (2) screws and remove the IS Terminal Block Cover.

8 Unscrew the two (2) remaining screws from the PCB stack.

For 3-4 Wire only, retain both the Aluminum Heat Sink Plate and the Thermal Conductive Pad underneath it. Both are located between the IS PCB and the bottom of the housing.

9 Pull the IS PCB from the Power Supply PCB while retaining the Thermal Isolation Barrier Pad located between the IS PCB and the Power Supply PCB, to be re-installed. The Thermal Isolation Barrier Pad is applicable for 3-4 Wire devices only.

10 Push the new IS PCB into the Power Supply PCB.

11 Screw the two (2) top screws into the PCB stack.

12 Replace IS Terminal Block Cover with the two (2) screws, onto the bottom of the PCB stack.

13 Screw the two (2) retention screws on the light blue IS TB on the IS PCB and replace the top of the plug.

14 Replace the entire PCB stack into the housing and screw the four (4) standoffs into place.

15 Reconnect the tops of the plugs for any other terminal blocks in use (MODBUS, Alarms, Fault, and Remote Acknowledge).

16 Replace the two (2) wires into TB1.

17 Replace the LCD PCB/CPU PCB set.

18 Replace the Housing Cover, tighten and secure the setscrew.

Replacing the Power Supply PCB (3-4 Wire)

This section provides information on how to replace Power Supply PCB (3-4 Wire).

Warning: *Ensure Receivers and Power Supplies are not powered when installing PCB into the device. Failure to do so could result in injury or death.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1. Ensure Receivers and Power Supplies are not powered when installing wire to the device.
2. Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.
3. Remove the two (2) wires from TB1.
4. Disconnect the tops of the plugs for any other terminal blocks in use (MODBUS, Alarms, Fault, and Remote Acknowledge).
5. Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.
6. Unscrew the two (2) screws and remove the IS Terminal Block Cover.
7. Unscrew the two (2) remaining screws from the PCB stack.
8. Pull the Terminal/Relay/MODBUS RS-485 PCB from the Power Supply PCB.

For 3-4 Wire only, retain both the Aluminum Heat Sink Plate and the Thermal Conductive Pad underneath it. Both are located between the IS PCB and the bottom of the housing.

9. Pull the IS PCB from the Power Supply PCB while retaining the Thermal Isolation Barrier Pad located between the IS PCB and the Power Supply PCB, to be re-installed. The Thermal Isolation Barrier Pad is applicable for 3-4 Wire devices only.
10. Remove the Wire Ribbon Cable from the Power Supply PCB.
11. Replace the Power Supply PCB and repeat the above steps in reverse.
12. Replace the Housing Cover, tighten and secure the setscrew.

Replacing the Power Supply PCB (2 Wire)

This section provides information on how to replace Power Supply PCB (2 Wire).

Warning: *Ensure Receivers and Power Supplies are not powered when installing PCB into the device. Failure to do so could result in injury or death.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1. Ensure Receivers and Power Supplies are not powered when installing wire to the device.
2. Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.
3. Remove the two (2) wires from the TB1.
4. Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.
5. Unscrew the two (2) screws and remove the IS Terminal Block Cover.
6. Unscrew the two (2) remaining screws from the PCB stack.
7. Pull the IS PCB from the Power Supply PCB.
8. Remove the Wire Ribbon Cable from the Power Supply PCB.
9. Replace the Power Supply PCB and repeat the above steps in reverse.
10. Replace the Housing Cover, tighten and secure the setscrew.

Trimming the 4-20mA Loop

This section provides information on how to trim the 4-20mA loop.

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1. System Manager access level is required. The path is MAIN MENU/USER ACCESS/SYSTEM MANAGER. Enter the four digits and select ENT/MENU key. See "Configuring the User Access Menu" on page 74.
2. From the Text and Numerical Display, enter the Main Menu by pressing the ENT/MENU key, select SETUP, Select MERIDIAN SETUP, and select CURRENT LOOPS.

One (1) is the default Sensor. To change: select ENTER/MENU key and use the Up or Down key to select Sensor 2 (to adjust loop 2) or 3 (to adjust loop3), then select ENTER/MENU.

3. Select 4MA OFFSET, then select ENTER/MENU key.
4. Connect a precision current measuring device to the corresponding loop being trimmed.

Ensure current measurement device is properly calibrated.

5 Use the UP or DOWN keys to increase or decrease the current on the loop until you have 4mA at your point of measurement.

6 Select ENTER/MENU key.

7 Select 20MA OFFSET, then select ENTER/MENU key.

8 Use the UP or DOWN keys to increase or decrease the current on the loop until you have 20mA at your point of measurement.

9 Select ENTER/MENU key.

10 Press ESC key, SAVE CHANGES? displays, press ENT/MENU key, SAVING displays and returns to MERIDIAN SETUP screen. Press ESC key three times to return to MAIN MENU screen.

Replacing the Terminal/Relay/MODBUS RS-485 PCB

This section provides information on how to replace Terminal/Relay/MODBUS RS-485 PCB.

Warning: *Ensure Receivers and Power Supplies are not powered when installing PCB into the device. Failure to do so could result in injury or death.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1 Ensure Receivers and Power Supplies are not powered when installing wire to the device.

2 Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.

3 Remove the two (2) wires from TB1.

4 Disconnect the tops of the plugs for any other terminal blocks in use (MODBUS, Alarms, Fault, and Remote Acknowledge).

5 Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.

6 Unscrew the two (2) screws and remove the IS Terminal Block Cover.

7 Unscrew the two (2) remaining screws from the PCB stack.

8 Pull the Terminal/Relay/MODBUS RS-485 PCB from the Power Supply PCB.

9 Replace the Terminal/Relay/MODBUS RS-485 PCB and repeat the above steps in reverse.

10 Replace the Housing Cover, tighten and secure the setscrew.

Replacing the LCD PCB/CPU PCB

This section provides information on how to replace LCD PCB/CPU PCB.

Warning: *Ensure Receivers and Power Supplies are not powered when installing PCB into the device. Failure to do so could result in injury or death.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1. Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.
2. Remove the Wire Ribbon Cable from the LCD PCB/CPU PCB.
3. Replace the LCD PCB/CPU PCB and repeat the above steps in reverse.
4. Replace the Housing Cover, tighten and secure the setscrew.

Replacing the Meridian NPT Ex Seal

This section provides information on how to replace Meridian NPT Ex Seal that is located between the device and the Meridian Junction Box Assembly.

Warning: *Ensure Receivers and Power Supplies are not powered when installing PCB into the device. Failure to do so could result in injury or death.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1. Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.
2. Remove the two (2) wires from TB1.

Do not remove the Wire Ribbon Cable from the upper and lower PCB stack.

3. Disconnect the tops of the plugs for any other terminal blocks in use (MODBUS, Alarms, Fault, and Remote Acknowledge).
4. Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.
5. Unscrew the two (2) screws and remove the IS Terminal Block Cover.
6. Unscrew the six (6) screws on the light blue IS TB and remove the six (6) wires from the TB.
7. Unscrew the Meridian NPT Ex Seal from the device.
8. Unscrew the Meridian Junction Box Assembly Cover.
9. Unscrew the six (6) screws on the light blue TB4 and remove the six (6) wires from the TB4 inside the Meridian Junction Box Assembly.
10. Unscrew the Meridian NPT Ex Seal from the Meridian Junction Box Assembly.
11. Pull the six (6) wires on top of the Meridian NPT Ex Seal into the device's 3/4" NPT hole.

12 Screw the Meridian NPT Ex Seal into the device.

When installing the Meridian NPT Ex Seal, thread into the 3/4" NPT hole, hand tighten, then tighten an additional 1/4 to 3/4 turns.

Warning: *To maintain Explosion Proof/Flame Proof a minimum of 5 threads of engagement is required. Failure to do so could result in injury or death.*

13 Insert the six (6) wires into the light blue IS TB and screw them down. See "Connecting the Sensor Head" on page 49.

14 Screw the two (2) retention screws on the light blue IS TB on the IS PCB and replace the top of the plug.

15 Ensure the top of all your applicable plugs with feeding wires are easely accessible prior to replacing the PCB stack to ease re-plugging.

16 Replace the PCB stack into the housing.

17 Replace the four (4) standoffs.

18 Replace the IS Terminal Block Cover and tighten the two (2) screws.

19 Re-connect the tops of the plugs for any other terminal blocks in use (VDC, MODBUS, Alarms, Fault, and Remote Acknowledge).

20 Replace the two (2) wires to TB1.

21 Replace the LCD PCB/CPU PCB set into t he four (4) standoffs.

22 Replace the Housing Cover, tighten and secure the setscrew.

23 Unscrew the Meridian Junction Box Assembly Cover.

24 Pull the six (6) wires on bottom of the Proof/Flame Proof Seal into the Meridian Junction Box Assembly's 3/4" NPT hole.

25 Screw the Meridian Junction Box Assembly onto the Meridian NPT Ex Seal.

When installing the Meridian NPT Ex Seal, thread into the 3/4" NPT hole, hand tighten, then tighten an additional 1/4 to 3/4 turns.

Warning: *To maintain Explosion Proof/Flame Proof a minimum of 5 threads of engagement is required. Failure to do so could result in injury or death.*

26 Insert the six (6) wires into the light blue TB4 and screw them down. See "Mounting and Wiring the Meridian Junction Box Assembly (Al or SS)" on page 31.

27 Replace the Meridian Junction Box Assembly Cover and secure the setscrew.

Replacing the Meridian Detector Body Assembly

This section provides information on how to replace Meridian Detector Body Assembly.

Warning: *Ensure Receivers and Power Supplies are not powered when installing PCB into the device. Failure to do so could result in injury or death.*

Warning: *Ensure the atmosphere is free from combustible and/or toxic gases prior to starting this procedure.*

1. Ensure Receivers and Power Supplies are not powered when installing wire to the device.
2. Unscrew the setscrew and Housing Cover, then pull on the LCD PCB/CPU PCB set, removing it from the four (4) standoffs.
3. Remove the two (2) wires from TB1.

It is not necessary to remove the Wire Ribbon Cable from the upper and lower PCB stack.

4. Disconnect the tops of the plugs for any other terminal blocks in use (MODBUS, Alarms, Fault, and Remote Acknowledge).
5. Unscrew the four (4) standoffs and lift the entire PCB stack from the housing.
6. Unscrew the two (2) screws and remove the IS Terminal Block Cover.
7. Unscrew the six (6) screws on the light blue IS TB and remove the six (6) wires from the TB.
8. Remove Meridian End Cap and Sensor.
9. Unscrew the Meridian Detector Body Assembly from the device.
10. Select the replacement Meridian Detector Body Assembly.
11. Pull the six (6) wires on top of the Meridian Detector Body Assembly into the device's 3/4"NPT hole.
12. Screw the Meridian Detector Body Assembly into the device.

When installing the Meridian Detector Body Assembly, thread into the 3/4" NPT hole, hand tighten, then tighten an additional 1/4 to 3/4 turns.

Warning: *To maintain Explosion Proof/Flame Proof a minimum of 5 threads of engagement is required. Failure to do so could result in injury or death.*

13. Insert the six (6) wires into the light blue IS TB and screw them down. See "Connecting the Sensor Head" on page 49.
14. Replace the IS Terminal Block Cover and tighten the two (2) screws.
15. Ensure the top of all your applicable plugs with feeding wires are easily accessible prior to replacing the PCB stack to ease re-plugging.
16. Replace the PCB stack into the housing.

17 Replace the four (4) standoffs.

18 Re-connect the tops of the plugs for any other terminal blocks in use (VDC, MODBUS, Alarms, Fault, and Remote Acknowledge).

19 Replace the LCD PCB/CPU PCB set into t he four (4) standoffs.

20 Replace the Housing Cover, tighten and secure the setscrew.

21 Replace the Meridian End Cap and secure the setscrew.

Caution: *Meridian End Cap must be attached to protect the device from ingress from water or dust. Ensure all sensor(s) are installed prior to operation. Ensure Meridian End Cap is installed prior to operation. Only use Meridian End Cap P/N 096-3437-1 or 096-3437-2.*

Re-Mapping the Sensors

This section describes how to Re-map the Sensors.

When the sensor mapping is changed from its initial mapping an error message on the LCD displays and the Fault LED flashes. The sensors need to be changed back to their initial mapping. For example, initially Sensor1 was a Cat-Bead, Sensor2 was a O_2 and Sensor3 was a E-Chem. Later the sensor were changed by mistake, and you want to change them back. Sensor1 is a O_2, Sensor2 is a E-Chem and Sensor3 is a Cat-Bead.

Removing power is not required when installing/replacing the Sensor. Follow local procedures and safety regulations.

Warning: *Alarm Settings are stored in the sensor. Changing sensor changes Alarm Settings. Verify prior to proceeding.*

Removing a Sensor creates a Fault condition (FLT LED blinks, error message alternates between System Fault and Sensor Offline on the LCD). To avoid this fault condition, using the Menu, enter access, take sensor offline and save the change, then remove the sensor. This is temporary, as the device automatically converts to the Sensor back to being online.

Some E-Chem Sensors ship equipped with a E-Chem Sensor Bias Assembly. This keeps the E-Chem Sensor warm to reduce warm up time at installation. It is not reusable.

Warning: *To prevent risk of injury or death, do not take the E-Chem Sensor Bias Module into a potentially explosive atmosphere.*

1 Remove the E-Chem Sensor Bias Module from the E-Chem Sensor, if applicable.

Warning: *The order that the sensors are installed is important. The order of installation defines the corresponding loop. For example, the first Sensor installed is assigned to Loop1, the second Sensor installed is assigned to Loop2, the third Sensor installed is assigned to Loop3. You must conform to the sensor type rules per sensor position in the system configuration as outlined in* Table 17*. When Illegal Configuration occurs - Not Intrinsically Safe. Sensor configuration rules are violated or are attempted, the device automatically goes into an immediate fault mode. Failure to adhere to the correct sensor mapping could result in injury or death.*

2 Ensure the device has power.

3 Using the Menu, ensure System Manager access is set.

4 Set Sensors Enable to 0 and Save using the applicable keys.

5 Sensor Enable automatically resets to 1.

6 Set Sensor Enable to either 2 or 3 as applicable and Save.

7 Remove all three (3) Sensors.

8 Re-insert each Sensor in the proper order one (1) at a time and acknowledge via LCD.

Clearing a Sensor Fault

This section describes how to Clear a Sensor Fault.

A sensor fault message appears on the LCD and the FLT LED blinks, when the sensor is exposed to a high concentration of the target gas.

The high concentration shortens the life of the sensor. This applies to E-Chem and Cat-Bead sensors.

1 To clear the fault, activate the Enter/Menu key.

Troubleshooting the Device

Refer to Table 62 for troubleshooting assistance.

Warning: *If the device does not function properly, remove from service and mark for maintenance. All PCBs are field replaceable. Only use Scott Safety replacement parts.*

Table 62 Troubleshooting Matrix

SYMPTOM	CAUSE	SOLUTION
Sensor not Read by Gas Detector.	**1** Intrinsically Safe (IS) Barrier PCB circuit is open.	**1** Replace Intrinsically Safe (IS) Barrier PCB. See "Replacing the Intrinsically Safe (IS) Barrier PCB" on page 116.
Gas Detector does not operate.	**1** No power applied to Gas Detector.	**1** Verify proper VDC input is applied to Gas Detector. • If voltage is verified, then replace Power Supply PCB. See "Replacing the Power Supply PCB (3-4 Wire)" on page 118.
Loss of 4-20mA signal.	**1** Damaged to 4-20mA circuit.	**1** Replace Power Supply PCB.See "Replacing the Power Supply PCB (3-4 Wire)" on page 118.
Relay(s) do not function.	**1** Alarm set points incorrect. **2** Low power to transmitter. **3** Bad Terminal/Relay/ MODBUS RS-485 PCB	**1** Verify alarm settings. **2** Verify transmitter supply voltage is within the proper VDC range. **3** Replace Terminal/Relay/MODBUS RS-485 PCB. See "Replacing the Terminal/Relay/MODBUS RS-485 PCB" on page 120.
Gas Detector (CPU) appears hung, or it continues to reboot.	**1** Firmware malfunction.	**1** Remove power for 10 to 15seconds, then reapply power. • If no change, then replace CPU PCB. See "Replacing the LCD PCB/CPU PCB" on page 121.
Device Zero Drifts.	**1** Needs Calibration. **2** Interfering gas present. **3** Rapid temperature changes.	**1** Zero Calibrate the device. **2** Place Zero Air on Sensor to determine if outside gas is present. **3** If possible, shield Sensor from source of temperature changes.
Device's output is continuously negative.	**1** It was probably Zero Calibrated with background gas present.	**1** Apply a source of clean air to Sensor and Zero Calibrate.

Table 62 Troubleshooting Matrix (continued)

SYMPTOM	CAUSE	SOLUTION
Device does not respond to Calibration Gas.	**1** Bad or weak Calibration Gas. **2** Poor gas delivery. **3** Poor Calibration technique. **4** Incorrect Calibration Gas. **5** Incorrect Calibration Gas concentration. **6** Bad Sensor. **7** Open circuit on the Intrinsically Safe (IS) Barrier PCB. **8** K-Factor not applied.	**1** Test the device with the Sensor Simulator. Replace Calibration Gas Source. **2** Verify proper Regulator, Tubing (Tygon, Teflon), Calibration Fitting are used. • Check Tubing for cuts. • For Cl_2 applications, confirm Regulator/Tubing was not used with H_2S. Also confirm that other reducing gases were not used, like Ammonia, Hydrides etc. • For sticky gases (HF, HCl Cl_2, SO_2, BCl_3 etc.), confirm that Teflon Tubing is being used. • Check Calibration Adapter is not plugged. • Windy environment. **3** Follow proper Calibration procedure. See “Calibration Methods” on page 110. **4** Replace Calibration Gas Source. • Verify sensor range is = or > calibration gas concentration. **5** Follow proper Calibration procedure. See “Calibration Methods” on page 110. **6** Replace Sensor.See “Replacing the Sensor” on page 115. **7** Replace the Intrinsically Safe (IS) Barrier PCB. See “Replacing the Intrinsically Safe (IS) Barrier PCB” on page 116. **8** Enter the K-Factor into its parameter field after applicable calculations. See “Combustible Cat-Bead Sensor K-Factors” on page 143.
LCD is blank although the device is producing an output signal.	**1** LCD contrast too low. **2** 24VDC power not wired correctly, or no power supplied, or <24VDC applied.	**1** Adjust LCD contrast. **2** Ensure proper VDC power is supplied, or wires properly landed.
Loss segments in LCD.	**1** Failed LCD segments.	**1** Replace LCD PCB. See “Replacing the LCD PCB/CPU PCB” on page 121.
LCD displays Cal Required	**1** Bad or weak Calibration Gas. **2** Poor Calibration technique.	**1** Replace Gas Source. **2** Follow proper Calibration procedure. See “Calibration Methods” on page 110.
LCD displays Under range	**1** Gas reading is below zero. **2** Interference gas present and gives negative reading. **3** Sensor drifted.	**1** Re-zero in clean air. **2** Check for possible interference gas. **3** Re-zero and calibrate.

Table 62 Troubleshooting Matrix (continued)

SYMPTOM	CAUSE	SOLUTION
LCD displays Over Range	**1** Exposed to gas concentration higher than its range. **2** Sensor exposed to interference gas higher than sensor range. **3** Sensor is not settled yet, or sensor is out of balance.	**1** Check test gas verses sensor range. **2** Apply clean air. **3** Wait for sensor to settle. Rebalance the sensor (zero for IR and Cat Bead sensors).
LCD displays Sensor X is Offline and Fault LED Flashes OR LCD displays System Fault	**1** Sensor is removed from device. **2** Sensor connection not fully engaged.	**1** Replace sensor. See “Replacing the Sensor” on page 115. **2** Verify Sensor is pushed firmly into detector head.
LCD displays I.S. Violation and Fault LED Flashes	**1** Sensor mapping has changed from initial configuration.	**1** Re-map the sensors. See “Re-Mapping the Sensors” on page 124.
LCD displays Sensor Fault	**1** Exposed to gas concentration higher than its range.	**1** Clear the Sensor Fault. See “Clearing a Sensor Fault” on page 125.

Appendix A

SCOTT SAFETY SPECIFICATIONS

Appendix Overview

This appendix covers the following topics:

- Device Specifications
- Combustible (LEL), IR, Cat-bead and MOS Sensor Specifications
- Toxic (E-Chem) Sensor Specifications

Device Specifications

Table 63 lists the device's specifications.

Table 63 Device Specifications

DEVICE SPECIFICATIONS		
Power Requirements	3-4 Wire PCB (All Relays energized, with LCD Heater, and with one Optional Communications PCB)	10 to 30VDC 8.5Watts 24VDC@355mA Max. Note: Voltages as measured at the device.
	3-4 Wire PCB (All Relays energized, without LCD Heater, and with one Optional Communications PCB)	10 to 30VDC 6.0Watts 24VDC@250mA Max. Note: Voltages as measured at the device.
	2 Wire PCB	18 to 30VDC, 21.6mA Max. Note: Voltages as measured at the device.
	4 Wire Loop Power Supply	10-30VDC, 24mA Max. Note: Voltages as measured at the device.
Relays	Four configurable form C (SPDT) relays rated for 5A @ 30VDC or 250VAC resistive	
	Relay1, Relay2 and Relay3 level alarms are configurable for High or Low trip, for normally energized (Failsafe) or normally de-energized and for latching or non-latching	
	Relay4 is always normally energized for failsafe operation so loss of power to the device indicates a Fault condition.	
Loop Load Resistance at nominal 24VDC	• 3 Wire Non-Isolated (Source) • For HARTWired	• 840Ω Max. • 230 to 600Ω
	• 3 Wire Non-Isolated (Sink) • For HARTWired	• 680Ω Max. • 230 to 600Ω
	4 Wire Isolated (Sink and Source)	680Ω Max.
4 to 20mA Current Loop	• 1 Loop Per Sensor, Normal Signaling • Connection Types • Inhibit Current • Fault Current	• 4 to 21.6mA • Sink, Source, Non-Isolated, & Isolated • Configurable • 3.6mA
Communications – Standard	• MODBUS RTU (RS-485) • RTU legal address range is 1 to 247 • Up to 32 RTUs per loop • 1,200Meters Maximum distance @19.2Kbs using Belden 9841 twisted-pair cable	

Table 63 Device Specifications (continued)

DEVICE SPECIFICATIONS		
Communications Expansion Cards (CEC) – Optional PCB	• WiredHART PCB • HART Version 7.2 or higher • Interface – Emerson Model 375 or 475 Handheld Field Communicator, AMS-HART Version 5-7, Custom HART AMS (DCS, SCADA, PLC) • Rx (Controller) to Tx (Fixed Gas Device) Theoretical Maximum Cable Distance is 10,000Ft (3,000meters). For details refer to the HART Communication Application Guide. • Fault Loop Current – 3.2mA	
Memory	• Non-Volatile Memory (NV-EEPROM) • Ensures configuration parameters retained during power loss.	
Number of Sensors	3 Sensors Maximum	
Duct Mount Adapters	Flow Velocities	350 to 1000CFM
	Compatibility	• Flat • Round: for 6” to 8” Diameter Ducts
Calibration	Both Zero and Span supported	
LED	3 Alarms and 1 Fault	
Heater Actuation (for LCD with Heater only)	Heater ON: When <-10°C Heater OFF: At 0°C Parameter is not configurable.	
Transmitter Housing	Material	Aluminium or Stainless Steel with (2) 3/4”NPT conduit connections
	Dimensions (Both Al and SS)	5.79Hx6.57Wx5.69”D (147.07Hx166.88Wx144.53Dmm)
	Mounting Flanges Holes (Both Al and SS)	ID 0.30” on 5.85” centers (ID 7.62mm on 148.59mm centers)
	Weight (includes housing, PCB stack, detector assembly, sensor and Meridian End Cap)	• 6.52Lbs. (2.96Kg) Aluminium Device • 11.0Lbs. (4.98Kg) Stainless Steel Device
Remote Sensor Junction Housing with (4) 3/4”NPT conduit connections – Aluminium	Dimension	4.70Hx4.70Wx3.55”D (119.38Hx119.38Wx190.17Dmm)
	Mounting Flanges Holes	ID 0.30” on 4.41” centers (ID 7.62mm on 112.01mm centers)
	Weight	1.7Lbs. (0.77Kg)
Remote Sensor Junction Housing with (4) 3/4”NPT conduit connections – Stainless Steel	Dimension	4.86Hx4.86Wx3.86”D (123.5Hx123.5Wx98.0Dmm)
	Mounting Flanges Holes	ID 0.33” on 5.59” centers (ID 8.5mm on 142mm centers)
	Weight	5.2Lbs. (2.35Kg)

Table 63 Device Specifications (continued)

DEVICE SPECIFICATIONS	
Field Wiring	• Plug-In Connectors: 28AWG to 16AWG (0.14mm^2 to 1.5mm^2) • Input Power Connector: 18AWG to 10AWG (0.2mm^2 to 4mm^2) • Wiring Temperature: 105°C Minimum
Remote Intrinsically Safe Cable	• The cable between Remote Sensor and Meridian Junction Box Assembly must be a 6 conductor, 18AWG (approximately 0.82mm^2) minimum size, shielded, insulation thickness 0.4mm minimum appropriate for Intrinsically Safe applications. It should meet IEC 60079-14 standard or its equivalent. • 100 Ft. (30.48m) Maximum distance from a Transmitter to any Sensor. Reference control drawings: 096-3506-B for 3-4 Wire and 096-3507-B for 2 Wire.
Operating Temperature	-40.0 to +167°F (-40 to +75°C)
Storage Temperature	-67.0 to +167°F (-55 to +75°C)
Operating Humidity	5 to 95% RH, Non-Condensing

Combustible (LEL), IR, Cat-bead and MOS Sensor Specifications

Table 64 lists Combustible (LEL), IR, Cat-bead and MOS sensor specifications. See "Parts List" on page 160.

Table 64 Combustible (LEL), IR, Cat-bead and MOS Sensors Specifications

COMBUSTIBLE (LEL), IR, CAT-BEAD AND MOS SENSOR SPECIFICATIONS		
IR - Combustible (LEL) Sensor		
Default Range	0 to 100% LEL	
Accuracy	50%LEL and below:	±3%LEL
	>50%LEL:	±5%LEL
Warm Up Time	5 Mins.	
Response Time	T90 <20Sec	
Operating Temp.	-40.0 to +167°F (-40 to +75°C)	
Storage Temp.	-67.0 to +167°F (-55 to +75°C)	
Humidity	0 to 95% RH, Non-Condensing	
Default Cal Gas	CH_4	
IR - Carbon Dioxide (CO_2) Sensor		
Default Range	0-5% V/V	
Accuracy	± 0.25%V/V	
Warm Up Time	5 Mins.	
Response Time	T90 <30Sec	
Operating Temp.	-40.0 to +167°F (-40 to +75°C)	
Storage Temp.	-4.0 to +122°F (-55 to +75°C)	
Humidity	0 to 95% RH, Non-Condensing	
Default Cal Gas	CO_2	
Cat-Bead - Combustible (LEL) Sensor		
Default Range	0-100%LEL	
Accuracy	≤50%LEL:	±3%LEL
	>50%LEL:	±5%LEL
Warm Up Time	5 Mins.	
Response Time	T90 <20Sec	
Operating Temp.	-40 to +167°F (-40°C to +75°C)	
Storage Temp.	-67 to +167°F (-55 to +75°C)	
Humidity	0 to 95% RH, Non-Condensing	
Default Cal Gas	CH_4	
MOS – Hydrogen Sulfide (H_2S)		
Default Range	0-100PPM	

Table 64 Combustible (LEL), IR, Cat-bead and MOS Sensors Specifications

COMBUSTIBLE (LEL), IR, CAT-BEAD AND MOS SENSOR SPECIFICATIONS	
Accuracy	± 6PPM or 10% applied gas concentration, which ever is greater
Warm Up Time	24 to 48Hours (We recommend calibration or re-calibration after sensor is powered for 24 to 48 hours)
Response Time	T50 <20Sec
Operating Temp.	-40 to +167°F (-40 to +75°C)
Storage Temp.	-67 to +167°F (-55 to +75°C)
Humidity	5 to 95% RH, Non-Condensing
Default Cal Gas	H_2S

Toxic (E-Chem) Sensor Specifications

Table 65 lists some of the Toxic (E-Chem) sensor specifications.

We offer two (2) types of E-Chem Sensors: Standard and Rock Solid.

- The Standard E-Chem Sensors – Capable of detecting higher concentrations than the Rock Solid E-Chem Sensors.
- The Rock Solid E-Chem Sensors – Baseline is more stable and accurate. Allows lower range and lower alarm settings. Less susceptible to interference gases. Faster response and recovery time. Compared to the Standard E-Chem Sensors.

Table 65 Toxic (E-Chem) Sensors Specifications

096-3473 -XX	GAS	SYMBOL	TYPE**	RH RATING ***	OPERATING TEMP RANGE (°C)	DEFAULT RANGE (PPM)****	RANGE (MIN. TO MAX.) (PPM)*****	DEFAULT CAL GAS
03	Ammonia	NH_3	Std.	G	-5 to 50 (-40 to 50)#	100	50 to 500	NH_3
07	Arsine	AsH_3	Std.	G	-40 to 50	1000ppb	500ppb to 1000ppb	PH_3
33	Boron Trichloride	BCl_3	RS	H	-25 to 50	10	10	SO_2
34	Boron Trifluoride	BF_3	RS	H	-25 to 50	5	5 to 15	SO_2
24	Bromine	Br_2	RS	H	-40 to 50	10	1 to 10	Cl_2
01	Carbon Monoxide	CO	Std.	G	-40 to 50	100	50 to 1000	CO
20	Chlorine	Cl_2	RS	H	-40 to 50	5	1 to 30	Cl_2
21	Chlorine	Cl_2	RS*	L	-40 to 50	5	1 to 30	Cl_2
52	Chlorine	Cl_2	Std.	G	-40 to 50	5	5 to 10	Cl_2
37	Chlorine Dioxide	ClO_2	RS*	H	-40 to 50	5	1 to 5	Cl_2
38	Chlorine Dioxide	ClO_2	RS	L	-40 to 50	5	1 to 5	Cl_2
18	Diborane	B_2H_6	RS	H	-10 to 50	0.5	0.5 to 5	HCN
17	Diborane	B_2H_6	RS	L	-10 to 50	0.5	0.5 to 5	HCN
15	Ethylene Oxide (ETO)	C_2H_4O	Std.	G	-20 to 50	10	10	ETO
22	Fluorine	F_2	RS	H	-40 to 50	5	1 to 5	Cl_2
23	Fluorine	F_2	RS*	L	-40 to 50	1	1 to 5	Cl_2
53	Fluorine	F_2	Std.	G	-40 to 50	10	10 to 25	Cl_2
10	Germane	GeH_4	Std.	G	-40 to 50	1000ppb	1000ppb	PH_3
12	Hydrogen	H_2	Std.	H	-40 to 50	4%	1 to 4%	H_2
13	Hydrogen	H_2	Std.*	L	-40 to 50	4%	1 to 4%	H_2
29	Hydrogen Bromide	HBr	RS	H	-25 to 50	10	1 to 30	SO_2
30	Hydrogen Bromide	HBr	RS*	L	-25 to 50	5	1 to 30	SO_2
25	Hydrogen Chloride	HCl	RS*	H	-25 to 50	10	1 to 25	SO_2

Table 65 Toxic (E-Chem) Sensors Specifications (continued)

096-3473 -XX	GAS	SYMBOL	TYPE**	RH RATING ***	OPERATING TEMP RANGE (°C)	DEFAULT RANGE (PPM)****	RANGE (MIN. TO MAX.) (PPM)*****	DEFAULT CAL GAS
26	Hydrogen Chloride	HCl	RS	L	-25 to 50	10	1 to 25	SO_2
46	Hydrogen Chloride	HCl	Std.	H	-25 to 50	25	10 to 100	HCl
47	Hydrogen Chloride	HCl	Std.	L	-25 to 50	25	10 to 100	HCl
16	Hydrogen Cyanide	HCN	RS	H	-10 to 50	10	10 to 25	HCN
11	Hydrogen Cyanide	HCN	Std.*	G	-20 to 50	25	25 to 100	HCN
27	Hydrogen Fluoride	HF	RS*	H	-25 to 50	10	1 to 30	SO_2
28	Hydrogen Fluoride	HF	RS	L	-25 to 50	10	1 to 30	SO_2
41	Hydrogen Sulfide	H_2S	Std.*	H	-40 to 50	50	25 to 200	H_2S
42	Hydrogen Sulfide	H_2S	Std.	L	-40 to 50	50	25 to 200	H_2S
02	Hydrogen Sulfide (Low Methanol cross sensitivity)	H_2S	Std.	G	-40 to 50	50	10 to 100	H_2S
50	Methanol	CH_3OH	Std.	G	-40 to 50	500	500	CH_3OH
43	Methyl Iodide	CH_3I	Std.	L	-40 to 50	25	25	H_2S
48	Methyl Mercaptan	CH_3SH	Std.	G	-25 to 50	3	3 to 10	CH_3SH
04	Monomethyl Hydrazine (MMH)	$CH_3(NH)NH_2$	Std.	G	-5 to 50 (-40 to 50)#	50	50	NH_3
14	Nitric Oxide	NO	Std.	G	-40 to 50	50	50	NO
54	Nitrogen Dioxide	NO_2	Std.	G	-40 to 50	10	10 to 20	NO_2
19	Oxygen	O_2	Std.	G	-30 to 50	25%	10 to 25%	N_2
39	Ozone	O_3	RS*	H	-40 to 50	1	1 to 3	Cl_2
40	Ozone	O_3	RS	L	-40 to 50	1	1 to 3	Cl_2
08	Phosphine	PH_3	Std	G	-40 to 50	500ppb	500 to 1000ppb	PH_3
09	Silane	SiH_4	Std.	G	-40 to 50	10	1ppm, 10ppm	PH_3
35	Silicon Tetrafluoride	SiF_4	RS	L	-25 to 50	5	5	SO_2
31	Sulfur Dioxide	SO_2	RS*	H	-25 to 50	10	1 to 25	SO_2
32	Sulfur Dioxide	SO_2	RS	L	-25 to 50	10	1 to 25	SO_2
05	Sulfur Dioxide	SO_2	Std.	H	-40 to 50	50	10 to 500	SO_2
06	Sulfur Dioxide	SO_2	Std.	L	-40 to 50	50	10 to 500	SO_2

Table 65 Toxic (E-Chem) Sensors Specifications (continued)

096-3473 -XX	GAS	SYMBOL	TYPE**	RH RATING ***	OPERATING TEMP RANGE (°C)	DEFAULT RANGE (PPM)****	RANGE (MIN. TO MAX.) (PPM)*****	DEFAULT CAL GAS
51	Tetraethyl Orthosilicate (TEOS)	$Si(OC_2H_5)_4$	Std.	G	-40 to 50	50	50	CH_3OH
36	Tungsten Hexafluoride	WF_6	RS	L	-25 to 50	1	1 to 3	SO_2

* Denotes the most common sensor used to monitor the gas when several options are available.

**Sensor Type – Standard or Rock Solid. Sensor Type - Rock Solid sensors have extremely low noise allowing for lower alarm set points with less false alarms.

*** The typical Humidity Range the sensor will be exposed to. (G) denotes General indoor or outdoor use, (H) denotes High humidity (70%RH, +/-15%RH) areas or outdoor use, (L) Low humidity (50%RH, +/-15%RH) for indoor use.

**** Default Range – This is the most popular range for each Scott sensor.

***** Range – All are PPM except where denoted.

NH_3 and MMH sensors operate down to -40°C if the environment is kept frost-free. In these conditions, a sampling line with gas dryer may be used. Please contact your Scott sales representative or Scott Safety. See "Technical Service" on page 158.

Note: Toxic (E-Chem) Sensor specifications vary from sensor to sensor. We provide a large number to select from. This list is not all-inclusive. For specific Part Numbers, please contact your Scott sales representative or Scott Safety. See "Technical Service" on page 158.

Appendix B

SCOTT SAFETY SENSOR INFORMATION

Appendix Overview

This appendix covers the following topics:

- Sensor Technology Overview
- Sensor Performance Factors
- Combustible Cat-Bead Sensor K-Factors
- Combustible IR Sensor Surrogate Test Gas
- Toxic (E-Chem) Gas Interferences
- MOS Sensor Interferences

Sensor Technology Overview

This section provides a basic introduction to Sensor Technology.

Table 66 provides an overview of the different types of Sensor technologies.

Table 66 Sensor Technology Comparison

TECHNOLOGY	DESCRIPTION	ADVANTAGES	LIMITATIONS
Cat-Bead	Beads consist of a wrapped coil of platinum wire covered with a ceramic base and then coated with a precious metal to act as the catalyst. The active, or sensing, bead is heated to temperatures up to 600°C to allow the oxidation of combustible gases to occur. The reference, or nonsensitive, bead remains at a lower temperature and is separated from the active bead by a thermal barrier. The resistance of the two beads is measured and compared using a Wheatstone bridge. Wheatstone bridge circuit: When gas burns on the active bead causing the temperature to increase, the resistance of the bead changes. As the bridge becomes unbalanced, the offset voltage is used to determine the measured value. The combustion that occurs across the active bead leads to an unbalanced output of the circuit. This value is then used to determine the concentration of combustible gas present.	• Low cost • Can be used to detect wide range of combustible gases • Proven technology for the detection of hydrogen	• High power • Susceptible to poisoning from chlorine, silicones and acid gases • Cannot be used in an oxygen deficient atmosphere • Unable to discriminate between different types of combustible gas
Infrared (IR)	Infrared light is a part of the electromagnetic spectrum that is comprised of invisible light that can be felt as heat. The wavelength profile of infrared is expressed in microns between 0.7 µm and 300 µm. Hydrocarbon combustible gas molecules can absorb certain wavelengths of IR called absorption bands and allow other wavelengths to transmit through. Each gas has a specific set of IR wavelengths that will absorb, called the absorption spectrum. This provides a unique identifier to monitor and detect target gases. Infrared sensors are designed to detect specific types of gases utilizing filters that will only allow a narrow band of wavelengths to pass through to a detector. This works on the same principle as a pair of sunglasses that filter out some of the sun's UV rays and visible light from your eyes.	• Long life • Resistant to contamination	• Unable to detect hydrogen • Unable to discriminate between different types of hydrocarbons
Electrical Chemical (E-Chem)	Electrochemical sensors provide monitoring for a wide variety of toxic gases. An aqueous electrolyte solution provides a conductive path for ions to travel between electrodes. Target gases are either reduced or oxidized at the working electrode resulting in a current flow between the working and the counter electrode. The reference electrode provides a zero reference point from which the resulting difference in potential between the counter and working electrodes can be compared. Target gas levels can be measured in parts per million (ppm). Rule of thumb: If you can't put your head into the environment being monitored, don't use an E-chem sensor to do the monitoring. • No liquid environments • No extreme temperatures or pressures • No high velocity duct mounts Note: We offer two types of E-Chem Sensors: Standard and RockSolid. See "Toxic (E-Chem) Sensor Specifications" on page 135.	• Low power • Wide range of gases can be detected • Low cost	• Life span shortened in arid or high humidity conditions • Some require oxygen

Table 66 Sensor Technology Comparison (continued)

TECHNOLOGY	DESCRIPTION	ADVANTAGES	LIMITATIONS
Metal Oxide Semiconductor (MOS)	Metal oxide semiconductor gas sensors utilize thin films of metal oxides placed upon a silica substrate. The substrate is heated around 200-600°C while the resistance of the metal oxide is continuously monitored. The sensor responds to changes in the atmosphere as the resistance value of the metal oxide changes when exposed to target gases.	• Performs well in high/low humidity • Long life span • In general, can detect both low ppm of toxic gases and higher concentrations of combustible gases	• Nonlinear response • Cannot be used in an oxygen deficient atmosphere

Sensor Performance Factors

This section provides a basic introduction to Sensor Performance Factors.

Table 67 provides an overview of may factors in selecting the correct sensor type for gas monitoring.

Table 67 Sensor Performance Comparison

FACTOR	DESCRIPTION	SENSOR TYPE
Target Gas	Identify the target gases that have a potential for providing a hazard in the process. Most sensors are applicable to mostly toxic or mostly combustible gas monitoring. However, some sensor types are capable of monitoring for either. Situations where several gases may pose a threat may be monitored for a presence.	Generally Toxic • Electrochemical • MOS Generally Combustible • Infrared • Catalytic Bead
Sensor Placement	Sensor effectiveness is directly impacted by sensor placement. Even the best sensor will not be able to detect a hazard if placed too far from release or receptor points. Consider zoned or voting coverage areas where multiple sensor points effectively provide a maximum, redundant coverage area to minimize false alarms and account for barriers and air currents, and all potential gas release points.	Application specific
Temperature/Humidity	Monitoring processes in severe environments can affect certain sensor types. All sensor types are rated for use in a specific temperature range. Some sensors can be affected in high humidity environments where water vapors can interfere with readings.	Varies
Oxygen Content	In applications where oxygen may be displaced or not present in a gas sample, the sensor type should be considered.	Cat bead, MOS and most E-Chem sensors will not perform as designed without oxygen present.
Power Consumption	Some sensor types consume much more power than others. This factor is important when considering whether a technology is appropriate for use in a fixed or portable detection device. Fixed detection systems must have appropriate power supplies to maintain the current necessary for sensor operation.	Varies
Cross Interference	Nearly all sensor types can be susceptible to interferences from other than target gases. Sensor manufacturers employ different methods to counter the effects of this through the use of filters, sensor construction materials, and preprogrammed expected response functions based on target gas characteristics. In some technologies, a sensor can be calibrated with an appropriate cross interference gas, if the target gas is unobtainable or difficult to be applied in field conditions. In this case, a K-factor should be applied to the calibration values.	Varies

Combustible Cat-Bead Sensor K-Factors

Cat-Bead Sensors can be used to accurately detect most combustible gases, especially hydrocarbons. The default calibration gas for these sensors is mostly Methane, since almost 90% of the combustible gas detection applications are for this gas. The other most popular gas used is Propane. Cat-Bead sensors respond differently based on different combustible gases. Thus, the following examples for each gas.

Although the target gas is always preferred in order to achieve maximum accuracy, these gases may not always be available in a form convenient for use in the field. Surrogate test gases are convenient substitutes, and have been selected for their stability and availability.

Using Target Gas Other than Methane

This section covers calibration to a target gas other than Methane, using that same target gas. For example:

1 User desires to measure Propane (C_3H_8) using a Cat-Bead sensor.

2 User has a Propane bottle of gas and the label reads 50%LEL.

a Adjust K-FACTOR field in the sensor setup menu to match the value for the target gas. In this example, Propane (C_3H_8) is 0.51. See "Configuring the Setup Menu" on page 62.

3 Ensure the CALGASCONC value matches the gas label, in this example, 50%LEL.

4 After calibrated, the device should read 50%LEL in Propane scale when 50%LEL Propane bottle gas is applied.

Using Methane as a Surrogate Gas

This section covers the Methane Surrogate Gas.

Table 68 provides the K-Factors referenced to methane calibration. The factors are the typical ratios of the response to the listed gases relative to the response to methane. The values are typical, but will vary from sensor to sensor and over the lifetime of a given sensor. When a gas other than the calibration gas is detected, divide the reading by the corresponding factor to estimate the actual gas concentration. For example, propane may be detected by the device calibrated with methane.

Note the concentration in %LEL on the label of the methane tank. Apply gas to the device and span to value derived by dividing this number with the given K-Factor. For example:

1 User desires to measure Isobutylene (C_4H_8) using a Cat-Bead sensor.

2 User has a Methane bottle of gas and the label reads 50%LEL.

a Adjust K-FACTOR field in the sensor setup menu to match the value for the target gas. In this example, Isobutylene (C_4H_8) is 0.58. See "Configuring the Setup Menu" on page 62.

3 User determines the CALGASCONC value.

a The K-Factor (Methane ratio) for Isobutylene (C_4H_8) is 0.58 (from Table 68 below).

b Divide 50%LEL by 0.58 K-Factor. This equals 86.2%LEL.

c Thus, the device's CALGASCONC parameter should be set to 86%LEL when exposed to 50%LEL Methane. See "Configuring the Setup Menu" on page 62.

4 After calibrated, the device should read 86%LEL in Isobutylene scale when 50%LEL Methane bottle gas is applied.

Table 68 K-Factors for Combustible Cat-bead Sensors - Methane

GAS/VAPOR*	K-FACTOR (PARAMETER FIELD)	K-FACTOR (METHANE RATIO)
Acetaldehyde (C_2H_4O)	0.64	0.64
Acetone (C_3H_6O)	0.60	0.60
Acetylene (C_2H_2)	0.63	0.63
Ammonia (NH_3)	1.43	1.43
Benzene (C_6H_6)	0.45	0.45
1,3-Butadiene (C_4H_6)	0.45	0.45
n-Butane (C_4H_{10})	0.52	0.52
Isobutane (C_4H_{10})	0.45	0.45
Isobutylene (C_4H_8)	0.58	0.58
Butyl Acetate ($C_6H_{12}O_2$)	0.40	0.40
n-Butyl Alcohol ($C_4H_{10}O$)	0.45	0.45
Chlorobenzene (C_6H_5Cl)	0.38	0.38
Cyclohexane (C_6H_{12})	0.46	0.46
Diethyl ether ($C_4H_{10}O$)	0.50	0.50
n-Decane ($C_{10}H_{22}$)	0.29	0.29
Ethane (C_2H_6)	0.68	0.68
Ethyl Acetate ($C_4H_8O_2$)	0.46	0.46
Ethyl Alcohol (C_2H_6O)	0.63	0.63
Ethylbenzene (C_8H_{10})	0.41	0.41
Ethylene (C_2H_4)	0.63	0.63
Ethylene Oxide (C_2H_4O)	0.49	0.49
Heptane (C_7H_{16})	0.42	0.42
n-Hexane (C_6H_{14})	0.40	0.40
Hydrogen (H_2)	0.81	0.81
Isopropyl Alcohol (C_3H_8O)	0.44	0.44
Methane (CH_4)	1.00	1.00
Methanol (CH_4O)	0.78	0.78
Methylene Chloride (CH_2Cl_2)	1.11	1.11
Methyl Chloride (CH_3Cl)	0.88	0.88
Methyl Ethyl Ketone (C_4H_8O)	0.43	0.43

Table 68 K-Factors for Combustible Cat-bead Sensors - Methane (continued)

GAS/VAPOR*	K-FACTOR (PARAMETER FIELD)	K-FACTOR (METHANE RATIO)
n-Otane (C_8H_{18})	0.32	0.32
Pentane (C_5H_{12})	0.51	0.51
Isopentane (C_5H_{12})	0.46	0.46
Propane (C_3H_8)	0.51	0.51
Propylene (C_3H_6)	0.62	0.62
Propylene Oxide (C_3H_6O)	0.44	0.44
Styrene (C_8H_8)	0.43	0.43
Tetrahydrofuran (C_4H_8O)	0.47	0.47
Toluene (C_7H_8)	0.42	0.42
Vinyl Chloride (C_2H_3Cl)	0.56	0.56
O-Xylene (C_8H_{10})	0.38	0.38
Note: K-Factors based on methane.		

Using Propane as a Surrogate Gas

This section covers the Propane Surrogate Gas.

Table 69 provides the K-Factors referenced to propane calibration. The factors are the typical ratios of the response to the listed gases relative to the response to propane. The values are typical, but will vary from sensor to sensor and over the lifetime of a given sensor. When a gas other than the calibration gas is detected, divide the reading by the corresponding factor to estimate the actual gas concentration. For example, methane may be detected by the device calibrated with propane.

Note the concentration in %LEL on the label of the propane tank. Apply gas to the device and span to value derived by dividing this number with the given K-Factor. For example,

1 User desires to measure Isobutylene (C_4H_8) using a Cat-Bead sensor.

2 User has a Propane bottle of gas and the label reads 50%LEL.

a Adjust K-FACTOR (Propane ratio) field in the sensor setup menu to match the value for the target gas. In this example, Isobutylene (C_4H_8) is 0.58. See “Configuring the Setup Menu” on page 62.

3 User determines the CALGASCONC value.

a The K-Factor for Isobutylene (C_4H_8) is 1.14 (from Table 69 below).

b Divide 50%LEL by 1.14 K-Factor. This equals 43.8%LEL.

c Thus, the device’s CALGASCONC parameter should be set to 43.8%LEL when exposed to 50%LEL Propane. See “Configuring the Setup Menu” on page 62.

4 After calibrated, the device should read 44%LEL in Isobutylene scale when 50%LEL Propane bottle gas is applied.

Table 69 K-Factors for Combustible Cat-bead Sensors - Propane

GAS/VAPOR*	K-FACTOR (PARAMETER FIELD)	K-FACTOR (PROPANE RATIO)
Acetaldehyde (C_2H_4O)	0.64	1.25
Acetone (C_3H_6O)	0.60	1.18
Acetylene (C_2H_2)	0.63	1.23
Ammonia (NH_3)	1.43	2.80
Benzene (C_6H_6)	0.45	0.88
1,3-Butadiene (C_4H_6)	0.45	0.88
n-Butane (C_4H_{10})	0.52	1.01
Isobutane (C_4H_{10})	0.45	0.88
Isobutylene (C_4H_8)	0.58	1.13
Butyl Acetate ($C_6H_{12}O_2$)	0.40	0.78
n-Butyl Alcohol ($C_4H_{10}O$)	0.45	0.88
Chlorobenzene (C_6H_5Cl)	0.38	0.74
Cyclohexane (C_6H_{12})	0.46	0.90
Diethyl ether ($C_4H_{10}O$)	0.50	0.98
n-Decane ($C_{10}H_{22}$)	0.29	0.56
Ethane (C_2H_6)	0.68	1.33
Ethyl Acetate ($C_4H_8O_2$)	0.46	0.90
Ethyl Alcohol (C_2H_6O)	0.63	1.23
Ethylbenzene (C_8H_{10})	0.41	0.80
Ethylene (C_2H_4)	0.63	1.23
Ethylene Oxide (C_2H_4O)	0.49	0.96
Heptane (C_7H_{16})	0.42	0.82
n-Hexane (C_6H_{14})	0.40	0.78
Hydrogen (H_2)	0.81	1.58
Isopropyl Alcohol (C_3H_8O)	0.44	0.86
Methane (CH_4)	1.00	1.96
Methanol (CH_4O)	0.78	1.52
Methylene Chloride (CH_2Cl_2)	1.11	2.17
Methyl Chloride (CH_3Cl)	0.88	1.72
Methyl Ethyl Ketone (C_4H_8O)	0.43	0.84
n-Otane (C_8H_{18})	0.32	0.62
Pentane (C_5H_{12})	0.51	1.00
Isopentane (C_5H_{12})	0.46	0.90
Propane (C_3H_8)	0.51	1.00
Propylene (C_3H_6)	0.62	1.21
Propylene Oxide (C_3H_6O)	0.44	0.86

Table 69 K-Factors for Combustible Cat-bead Sensors - Propane (continued)

GAS/VAPOR*	K-FACTOR (PARAMETER FIELD)	K-FACTOR (PROPANE RATIO)
Styrene (C_8H_8)	0.43	0.84
Tetrahydrofuran (C_4H_8O)	0.47	0.92
Toluene (C_7H_8)	0.42	0.82
Vinyl Chloride (C_2H_3Cl)	0.56	1.09
O-Xylene (C_8H_{10})	0.38	0.74
Note: K-Factors based on propane.		

Combustible IR Sensor Surrogate Test Gas

This section covers the Combustible IR Sensor (096-3473-56) with Custom Calibration Gas Options.

Some gas types are available pre-calibrated by the factory. The Combustible IR Sensors ship with an individual correction factor (to Propane or Propylene) on the certificate. Ensure these values on the certificate are used.

***Caution:** The device prompts "Cal Required" when new IR gas curve is selected. Ensure calibration is performed, otherwise device gas detection ability is compromised.*

Although the target gas is always preferred in order to achieve maximum accuracy, these gases may not always be available in a form convenient for use in the field. Surrogate test gases are convenient substitutes, and have been selected for their stability and availability.

When using a surrogate gas to test the device's combustible IR sensor (096-3473-56).

- Find the target gas in the "selected curve/target gas" column.
- Use only the test gas and concentration indicated. IR sensors do not have the same ratio of response between two gases throughout the entire detection range. These values are only valid for the indicated concentrations.
- For a bump test, apply the indicated surrogate test gas - the sensor should respond with a reading as indicated in the "sensor reading" column, with a tolerance of approximately ±2% LEL.
- If calibrating, set the span gas concentration to the value shown in the "sensor reading" column. Calibrate (zero and span) the sensor by following the instrument prompts, per the User Guide.

Example: to span for Toluene, apply 25%LEL propylene and span to 57% LEL (Toluene).

Table 70 lists the readings for the Combustible IR Sensor.

Table 70 Surrogate Test Gas for Combustible IR Sensors

SELECTED CURVE (TARGET GAS)	SURROGATE TEST GAS & CONCENTRATION	SENSOR READING (%LEL OF TARGET GAS)
Acetone (C_3H_6O)	0.5% v/v propylene (25% LEL)	41
Butane (C_4H_{10})	0.9% v/v propane (43% LEL)	44
Ethane (C_2H_6)	0.9% v/v propane (43% LEL)	34
Ethyl Alcohol (C_2H_5OH) (Ethanol)	0.9% v/v propane (43% LEL)	57
Ethylene (C_2H_4)	0.5% v/v propylene (25% LEL)	52
Hexane (C_6H_{14})	0.55% v/v propane (26% LEL)	39
Isopropyl Alcohol (C_3H_7OH) (Isopropanol, IPA)	0.55% v/v propane (26% LEL)	55

Table 70 Surrogate Test Gas for Combustible IR Sensors (continued)

SELECTED CURVE (TARGET GAS)	SURROGATE TEST GAS & CONCENTRATION	SENSOR READING (%LEL OF TARGET GAS)
Methyl Alcohol (CH_3OH) (Methanol)	0.9% v/v propane (43% LEL)	33
Octamethyltrisiloxane $C_8H_{24}O_2Si_3$	0.5% v/v propylene (25% LEL)	25
Pentane (C_5H_{12})	0.9% v/v propane (43% LEL)	52
Propane (C_3H_8)	0.9% v/v propane (43% LEL)	43
Propylene (C_3H_6) (Propene)	0.55% v/v propane (26% LEL)	55
Toluene (C_7H_8)	0.5% v/v propylene (25% LEL)	57
Xylenes (C_3H_{10})	0.5% v/v propylene (25% LEL)	28

Toxic (E-Chem) Gas Interferences

There are known gas interferences to a limited number of chemical compounds. Scott Safety attempts to identify possible gas interferences to which gas sensors may be exposed. However, not all chemical compounds that presently exist have been tested.

The Toxic (E-Chem) Gas Interferences tables (062-0064) are included on the CD that ships with the product. You can check our web site to compare your version to those posted. Updates to the tables are typically posted to our web site.

These specific tables apply to the Meridian device only.

MOS Sensor Interferences

Table 71 lists the readings for the MOS sensor when responding to gases other than H_2S.

Table 71 Gas Interferences For MOS Sensor

INTERFERENCE GAS	APPLIED CONCENTRATION	READINGS
Methane	3000PPM (6%LEL)	< 2PPM
Hydrogen	2500PPM (6%LEL)	< 5PPM
Carbon Monoxide	100PPM	< 2PPM
Ethanol	90PPM	< 7PPM
Sulfur Dioxide	15PPM	< 1PPM
Nitrogen Dioxide	10PPM	Negative Response

Appendix C

SAFETY INTEGRITY LEVEL (SIL-2) INFORMATION

Appendix Overview

This appendix covers the following topics:

- SIL-2 Parameters
- Proof Test Procedure

SIL-2 Parameters

Table 72 lists the device's Safety Integrity Level (SIL) parameters.

Table 72 SIL Parameters

SIL PARAMETERS	
Safe Failure Fraction (SFF)	90.45%
Average Probability of Failure on Demand (PFD_{avg})	8.81×10^{-4}
Probability of Failure per Hour (PFH)	1.99×10^{-7}
Process Time	24Hrs.
Proof Test Interval (PTI)	8760Hrs.

For the device's installation, operation, configuration, maintenance and specifications refer to the applicable sections of this guide.

Proof Test Procedure

This section details the proof test procedure.

This section outlines the procedure for performing an annual safety proof test of the transmitter. The SIL safety parameters presented in this manual assume an annual safety function proof test of the device to detect failure modes not detectable by built in diagnostic functions. Failure to perform an annual proof test invalidates the safety performance parameters presented herein.

***Warning:** Hazardous condition monitoring is disabled for the duration of this test and as such, should only be undertaken when conditions are known to be safe (i.e. unit shutdown/turn around). Scott Safety recommends alternative monitoring for hazardous conditions during the duration of this testing.*

Verification of the safety function requires the fault current to be adjusted to something other than 4mA for proper verification.

Tools Required:

- 3 mm (TBR) hex wrench
- Standard calibration gas
- Calibration gas (sufficient concentration to activate highest alarm level)
- Calibration adaptor
- DVM multi-meter

1 Bypass final element safety function to prevent inadvertent activation of safety shutdown systems (i.e. deluge/suppression/evacuation systems).

2 Using the hex wrench, loosen the setscrew securing the Meridian End Cap assembly to the sensor housing.

3 Remove the Meridian End Cap assembly.

4 Remove the sensor assembly from the sensor housing.

a Verify the fault relay (K4) de-activates (normally open)

b Verify the fault 4-20mA signal is transmitted to the receiving element of the safety system.

5 Reinstall sensor, Meridian End Cap, and secure the setscrew.

***Caution:** Meridian End Cap must be attached to protect the device from ingress from water or dust. Ensure all sensor(s) are installed prior to operation. Ensure Meridian End Cap is installed prior to operation. Only use Meridian End Cap P/N 096-3437-1 or 096-3437-2.*

6 Cycle power or perform power on reset of transmitter and wait for sensor warm up time to expire

7 Perform zero & span calibration of sensor as described herein and wait for inhibit time to expire

8 Challenge the sensor with upscale calibration gas and ensure that

a Alarms activate (K1, K2, & K3)

b 4-20mA signal reflects proper gas concentration reading

9 Restore safety system by disabling safety bypass systems.

Table 73 shows the expected results.

Table 73 SIL Proof Test Results

SECTION	TEST	ELEMENT	CRITERIA
4.1	Fault - Sensor communication	Relay	Impedance NO to Com >1MOhm
4.2	Fault - 4-20mA Signal	Current loop	Programmed fault current (<> 4mA)
8.1	Alarm activation	Relay	K1-K3 NC to Com >1MOhm
8.2	Gas reading	Current loop	± .1mA

Appendix D

SCOTT SUPPORT

Appendix Overview

This appendix covers the following topics:

- Technical Service
- Parts List

Technical Service

Congratulations on your purchase of a Scott Safety product. It is designed to provide you with reliable trouble-free service.

Contact us, if you have technical questions, need support, or if you need to return a product.

When returning a product, contact Technical Support to obtain a Return Material Authorization (RMA) number prior to shipping for service repairs.

North America
Scott Safety
Houston Service Center
1455 East Sam Houston Parkway South
Suite 190
Pasadena, TX 77503 USA
Technical Support Telephone: 1-800-247-7257
Technical Support FAX: 281-478-8772
E-Mail: scottgastechsupport@tycoint.com
Web Site: http://www.scottsafety.com/

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Web Site: http://www.scottsafety.com/

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Beijing branch, Shanghai Eagle Safety Equipment Co. Ltd.
Suite 708, Scitech Tower, No.22 Jianguomenwai Avenue, Chaoyang District, Beijing, 100004, P.R.China
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Asia
Scott Safety – Asia
Service Dept
2 Serangoon North Ave 5, #07-01
Singapore 554911
Telephone: +65. 6883 9671
Fax:+65. 6234 2691
E-Mail: hokchan@tycoint.com

Parts List

Table 74 provides a parts list. Some of these items are orderable, others are not.

Table 74 Parts List – Device

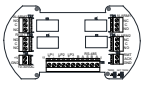
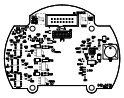
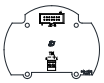
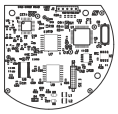
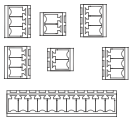
CATEGORY	ITEM	DESCRIPTION	PART NUMBER
Accessories		Terminal/Relay/MODBUS RS-485 PCB	096-3404
		3-4 Wire Power Supply PCB	096-3401
		2 Wire Power Supply PCB	096-3407
		3-4 Wire Intrinsically Safe (IS) Barrier PCB	096-3448
		2 Wire Intrinsically Safe (IS) Barrier PCB	096-3449
		Optional Communication Expansion Card (CEC) PCB	For Optional CEC PCBs, contact your Scott sales representative.
		LCD PCB and CPU PCB	096-3447-xx 01= includes LCD, but no LCD Heater 02= includes LCD and LCD Heater 03=No LCD (Blind)
		Connector/Jumper Replacement Kit 1-11Position Connector, 1-2Position Connector, 1- 3Position Connector, 1-6Position Connector and 1- 2Position Jumper	096-3495

Table 74 Parts List – Device (continued)

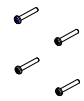
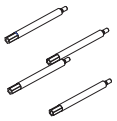
CATEGORY	ITEM	DESCRIPTION	PART NUMBER
Accessories		Screw Replacement Kit 4- 6-32 x 7-8 Phillips Pan Head Screws	096-3496
		Standoff Replacement Kit 4- M4 x 82 Standoffs	096-3497
		Intrinsically Safe (IS) Terminal Block Cover Isolates the IS wires.	074-0528-01
		Ribbon Cable (Between J2-A on the Power Supply PCB (for 3-4 Wire Isolated) and J2-B on the CPU PCB)	096-3456
		Meridian Detector Body Assembly	096-3484-xx 01=3-4 Wire & Plastic Meridian End Cap 02=3-4 Wire & SS Meridian End Cap 03= 2 Wire & Plastic Meridian End Cap 04= 2 Wire & SS Meridian End Cap
		Meridian NPT Ex Seal Provides explosive proof seal between Transmitter and Remote Junction Box.	096-3483
		Sun Shield Deflects Sun off of the Device, complete with mounting holes and rain drip ridge.	073-0373
		1/4 Turn Deluge-Wash Down Fitting Provides protection from wet weather and hose-downs.	096-3441
		Thermal Isolation Barrier Pad Only applicable for 3-4 Wire	077-1418
		Aluminum Heat Sink Plate Only applicable for 3-4 Wire	073-0381

Table 74 Parts List – Device (continued)

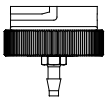
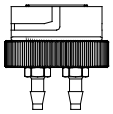
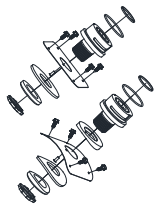
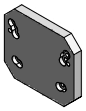
CATEGORY	ITEM	DESCRIPTION	PART NUMBER
Accessories		Thermal Conductive Pad Only applicable for 3-4 Wire	077-1419
		1/4 Turn Calibration Fitting Delivers calibration gas directly to the sensor face without dilution from environmental interferences such as wind. Barb fitting provided for tube connection to the calibration gas source (gas cylinder, permeation device or generator).	096-3438
		1/4 Turn Flow Cell Fitting Used in sample draw configurations. The baffle prolongs life by reducing air velocity past the sensor face.	096-3439
		1/4 Turn Dust Filter Fitting	096-3537
		Meridian End Cap Assembly	096-3437-x 1= Plastic 2= Stainless Steel
		Detector Head Sump Value Used when mounting device in low areas where water may accumulate to protect sensor	096-3539
		1/4 Turn Flat/Round Duct Mount Fitting Kit Used for either Flat or Round 6” to 8” Diameter Ventilation Ducts without drying out the Sensor.	096-3440
		Aluminum 1/2” thick Retrofit Mounting Plate with hardware Used to mount the Device where a previously mounted Scott transmitter was located and provides clearance to access Meridian End Cap.	073-0374

Table 74 Parts List – Device (continued)

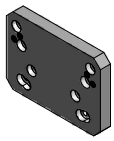
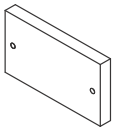
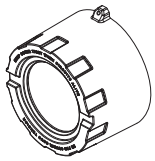
CATEGORY	ITEM	DESCRIPTION	PART NUMBER
Accessories		High Density Polyethylene (HDPE) 3/4” thick Retrofit Mounting Plate with hardware Used to mount the Device where a previous mounted Scott transmitter was located and provides clearance to access Meridian End Cap.	093-0607
		High Density Polyethylene (HDPE) Mounting Spacer Plate Used to add additional space between the device and the mounting surface.	074-0584
		Pipe Mounting Bracket for Gas Detector (Al & SS)	073-0377
		Pipe Mounting Bracket for Meridian Junction Box Assembly (Al)	073-0376
		3/4” NPT to 20mm Metric Thread Adapter	077-1402
		Enclosure Stop Plug Used to seal unused conduit entries.	077-1404
		Enclosure Replacement Cap	093-0603 (Al) 093-0604 (SS)
		Magnet Tool Used to access menus via the four (4) navigation keys	096-3482

Table 74 Parts List – Device (continued)

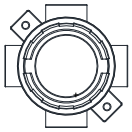
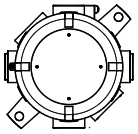
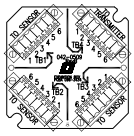
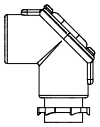
CATEGORY	ITEM	DESCRIPTION	PART NUMBER
Accessories		O-Ring Replacement Kit 1 – 4.53” Dia. Rubber O-Ring for Enclosure Cap Seal and 1 – Rubber O-Ring for Meridian Detector Body Assembly	096-3498
		Meridian Junction Box Assembly (Aluminum)	096-3475
		Meridian Junction Box Assembly (Stainless Steel)	096-3520
		Meridian Junction Box PCB	096-3434
		Meridian Junction Box Mounting Spacer Kit 2- 5/8” OD x .250”space and 2-5/8” OD x .750”spacer Recommended for integral installation and in environments with high vibration.	096-3532
		90° Elbow male-female, 3/4” NPT threads (2.08”H x 2.23”W), Zinc die cast Used for multi-sensor integral installations.	048-0089
		Remote Cable Gland Fitting Used in the Meridian Junction Box Assembly and IS Cable.	048-0091
		Remote Intrinsically Safe (IS) Cable	069-0097-10 = 10’ 069-0097-25 = 25’ 069-0097-50 = 50’ 069-0097-75 = 75’ 069-0097-100 = 100’

Table 74 Parts List – Device (continued)

CATEGORY	ITEM	DESCRIPTION	PART NUMBER
Accessories		Sensor Simulator with Knob Note: Simulator is for temporary use only.	096-3395
Manual		Meridian Transmitter CD	096-3487
Sensors – Toxic (E-Chem)		CO	096-3473-01
		H_2S Low Methanol	096-3473-02
		NH_3	096-3473-03
		MMH	096-3473-04
		SO_2 Hi RH	096-3473-05
		SO_2 Lo RH	096-3473-06
		AsH_3	096-3473-07
		PH_3	096-3473-08
		SiH_4	096-3473-09
		GeH_4	096-3473-10
		HCN	096-3473-11
		H_2 Hi RH	096-3473-12
		H_2 Lo RH	096-3473-13
		NO	096-3473-14
		EtO	096-3473-15
		HCN Hi RH	096-3473-16
		B_2H_6 RS Hi RH	096-3473-17
		B_2H_6 RS Lo RH	096-3473-18
		O_2	096-3473-19
		Cl_2 RS Hi RH	096-3473-20
		Cl_2 RS Lo RH	096-3473-21
		F_2 RS Hi RH	096-3473-22
		F_2 RS Lo RH	096-3473-23
		Br_2 RS Hi RH	096-3473-24
		HCl RS Hi RH	096-3473-25
		HCl RS Lo RH	096-3473-26
		HF RS Hi RH	096-3473-27
		HF RS Lo RH	096-3473-28

Table 74 Parts List – Device (continued)

CATEGORY	ITEM	DESCRIPTION	PART NUMBER
Sensors – Toxic (E-Chem)		HBr RS Hi RH	096-3473-29
		HBr RS Lo RH	096-3473-30
		SO_2 RS Hi RH	096-3473-31
		SO_2 RS Lo RH	096-3473-32
		BCl_3 RS Hi RH	096-3473-33
		BF_3 RS Hi RH	096-3473-34
		SiF_4 RS Lo RH	096-3473-35
		WF_6 RS Lo RH	096-3473-36
		ClO_2 RS Hi RH	096-3473-37
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		$C_8H_{24}O_2Si_3$ - Octamethyltrisiloxane	096-3554-02
		CH_3OH - Methanol	096-3554-03
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		C_3H_7OH - Isopropanol	096-3554-05
		C_7H_8 - Toluene	096-3554-06
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		C_6H_{14} - Hexane	096-3554-08

Table 74 Parts List – Device (continued)

CATEGORY	ITEM	DESCRIPTION	PART NUMBER
Accessories Calibration		0.5LPM Regulator 1.0LPM High Flow Regulator 0.3LPM Low Flow Regulator	077-0018 077-0254 077-1416
		Tygon Tubing, 3/16” ID, Soft (For Non-Reactive gases)	Different lengths are available.
		Teflon PFA Special Tubing, Hard (For sticky gases (Reactive gases) like HCL and NH_3)	
		Nafion Tubing, 1/4” Molded Header, 18” Length (For MOS sensors)	077-1422
		Remote Calibration Fitting - Plastic, with 1/8” ID Tubing	077-1385
		Remote Calibration Fitting – Stainless Steel, with 1/4” OD Tube	077-1386
Calibration Kits* (The specific Calibration Kit depends on the sensors in your device)		Standard Calibration Kit For non-reactive gases, such as O_2, CO or CH_4. Includes Carrying Case, 0.5LPM Male Regulator, and Tygon Tubing.	096-3500
		Reactive Calibration Kit For Reactive gases, such as NH_3, Cl_2 or HCl. Includes Carrying Case, 0.5LPM Male Regulator, and Teflon Tubing.	096-3501
		High Flow Calibration Kit For non-reactive, high-flow (or remote) applications. Includes Carrying Case, 1.0LPM Male Regulator, and Tygon Tubing.	096-3502
		Low Flow Calibration Kit For use with MOS or other sensors which require low flow. Includes Carrying Case, 0.3LPM Male Regulator, and Teflon Tubing and Nafion Tubing.	096-3503
* Calibration Kits do not include any Gas Cylinders. That must be determined at time of order. Calibration Cap sold separately. Note: For calibration equipment, contact your Scott sales representative. Note: When placing an order for Toxic (E-Chem) Sensors, please specify Part Number to ensure compatibility.			

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